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NOAA Data Report ERL GFDL-2

DEPARTMENT OF COMMERCE ★ UNITED STATES OF AMERICA ★

FGGE LEVEL III-B DAILY GLOBAL ANALYSES
PART II (MAR 1979 - MAY 1979)

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Geophysical Fluid Dynamics Laboratory
Princeton, New Jersey
July 1983

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Robert K. White
Kikuro Miyakoda

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UNITED STATES DEPARTMENT OF COMMERCE
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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
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FGGE LEVEL III-B
Daily Global Analyses
Part II (Mar 1979 - May 1979)

Jeffrey J. Ploshay, Robert K. White and K. Miyakoda

I. Introduction

This four-part booklet contains daily global analyses of the FGGE Level III-b data set produced at GFDL (Geophysical Fluid Dynamics Laboratory). GFDL was one of the two level III-b data producers for the entire FGGE year - the other producer was the ECMWF (European Centre for Medium-Range Weather Forecasts).

FGGE provided an unprecedented volume of meteorological data, from various sources, for the year 1979. The purposes of FGGE are to observe comprehensively and accurately the atmospheric state and circulation on a global scale, and to increase understanding of the dynamics of the equatorial atmosphere and ocean to ultimately improve weather and climate prediction.

For the sake of comparison by prospective level III-b data users, we decided to adopt a format for our booklet similar to the ECMWF booklet already published.

II. Outline of Analysis Process

The analysis process (4DA) used at GFDL to produce the FGGE III-b analyses, similar to Miyakoda et al. (1976), can be called a four-dimensional, continuous, data assimilation system. The system consists of three phases: preprocessing of input (level II-b) data, dynamic assimilation and initialization.

i) Preprocessing

Level II-b data from various sources, blocked into 6 hour intervals, are sorted by parameter. The parameters are: horizontal wind components u and v, temperature T, geoptential height Z, moisture (humidity r, depression of dewpoint temperature $T-T_d$, or mixing ratio of water vapor q), sea level pressure P_{SL}, sea level temperature T_{SL} and surface wind components U_{SL} and V_{SL}. During this step quality control is performed with respect to format, gross error and hydrostatic checks.

Next, the data is prepared for insertion in the dynamic analysis. First vertical and then lateral interpolation are performed to obtain gridded information from observation points. Vertical optimum interpolation (OPI), from arbitrary pressure levels onto 19 mandatory pressure levels is done for all variables. The range in vertical interpolation is limited to 3 consecutive levels.

The observed data is checked for its validity by comparing it with the analyzed fields that were produced by 4DA at the most recent synoptic time (i.e., 00 or 12 GMT). After the vertical interpolation, a "buddy" check (a comparative test with neighboring observations) is made at mandatory levels (Bergman, 1978).

The lateral interpolation to the model's grid is made by a horizontal "local" OPI (Gandin, 1963) from observation locations at the mandatory levels every 2 hours (i.e., 02, 04, 06, 08, 10, 12) for a 12-hour period. Data from two hour time blocks (e.g. 23 to 01 OMT) are collected from a 250 km radius around each grid point, up to a maximum of 8 observations. If there are no observations within range of a gridpoint, no insertion data is produced. The first guess used in the OPI at each grid point is the most recent synoptic time (00 or 12 GMT) 4DA. Weights are also determined for each grid point value based on the reliability (distance and observational error characteristics) of the contributing observations.

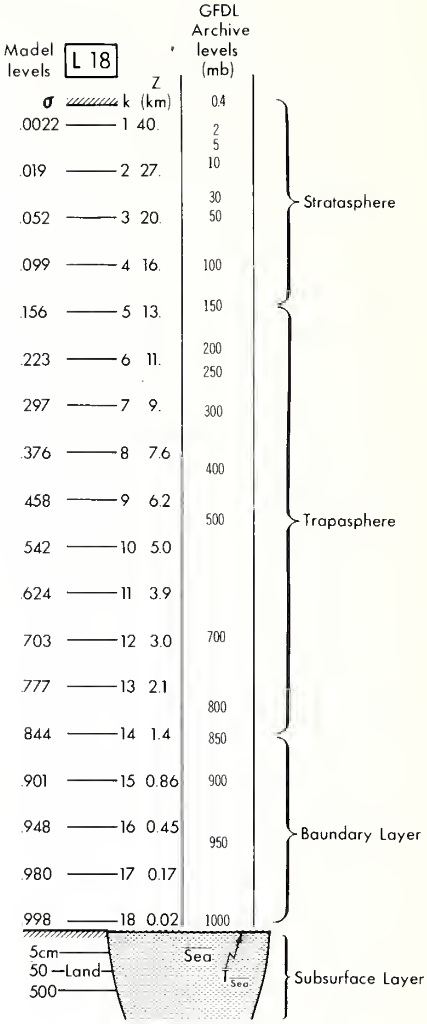
The final process in determining insertion data at a grid point is a time interpolation, to 2 hour periods, of values created by the local OPI and the model, in order to get time continuity of the insertion data. The time interpolation scheme involves a hierarchy of four interpolation values, where lower precedence data is used only if a higher precedence value has not yet been obtained. The order of precedence is: first the input data from optimum interpolation at the time (if it exists), second the grid points created by the 6 hour interpolation, third the grid points created by the 12 hour interpolation and, fourth the results of the model simulation of the initial time (00 or 12 GMT).

ii) Dynamic Assimilation

The general circulation model used for assimilation is the "spectral transform" model (Gordon and Stern, 1982; Fels and Schwarzkopf, 1975) with an assimilation system developed by Simmonds (1976, 1978)(see Figure 1). The insertion data at mandatory isobaric levels are interpolated to sigma-levels, using cubic splines on a log-p coordinate system. In the insertion process, these data replace the model's solution completely, or partially, depending on the weights assigned to them. If there is no data at a grid point the model's solution is retained. By repeated insertion of the same data at each time step over a 2-hour interval, a balanced state may be achieved that is faithful to the data, and is also consistent with the model's dynamics and physics. The model should impose its own constraints between the variables.

Before the data insertion, a quality control check is made by comparing the insertion data with the model's solution. If necessary, the insertion data is modified so that the difference between the model

GFDL-DATA ASSIMILATION SYSTEM SUMMARY



INSERTION DATA

* *method*	prepared by 3-dimensional, univariate, optimum interpolation
* *variables*	P_{SL},u,v,T,q on pressure levels (no data inserted at upper two model levels)
* *grid*	N40 gaussian, 19 pressure levels
* *first guess*	12-hour assimilation results
* *application*	every 12 hrs. (± 1 hour data window)

ASSIMILATION

* *method*	data injected into a global spectral model, using weighted time interpolation
* *variables*	P_*,T, ζ(vorticity), D(divergence), q on sigma levels
* *resolution*	R30L18 (rhomboidal truncation at 30 waves, 18 σ-levels)
* *time integration*	semi-implicit ($\Delta t=8\sim 20$ minutes-function of CFL criterion)
* *lateral diffusion*	$K\nabla^2$
* *vertical diffusion*	mixing length method (to 3 km depth), dry convective adjustment (above level 18)
* *boundary layer*	Monin-Obukhov process
* *topography*	spectrally truncated
* *radiation*	developed by Fels and Schwarzkopf (i) clouds - climatological monthly mean for each latitude (ii)application- diurnal variation; short- and long-wave radiation calculation every 2 hours
* *sea surface temperature*	RAND monthly climatological normals, yet varying daily
* *land surface temperature*	determined by surface heat balance, using 3 soil levels to model heat flux
* *moisture*	large scale condensation at 80% humidity saturation, cumulus parameterization by moist convective adjustment.

INITIALIZATION

* *method*	non-linear normal mode, 7 vertical modes (only modes with periods shorter than 6 hours adjusted)
* *application*	every 6 hours

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* *variables*	u,v (m/s), T(°K), mixing ratio (g/g), geopotential height (geop. meters), RH(%), vertical velocity (mb/sec), surface wind stress - τ_x, τ_y (N/m^2)
* *grid*	1.875° latitude/longitude, 19 pressure levels (9 pressure levels for MR and RH)

Figure 1

solution and the insertion data does not exceed a tolerance criterion. Data was not inserted into the model's top two levels.

iii) Initialization

Every 6 hours a non-linear normal model initialization procedure (developed by Machenhauer, 1977, and Ballish, 1980) is applied to the model solution. It has been designed to control the growth of spurious gravity modes but not to alter the model balance, especially in the tropics. The first 7 of 18 vertical modes are initialized allowing 4 iterations for convergence. In order to not risk initializing out gravity modes that might be important, especially in the tropics, only those modes with periods shorter than 6 hours are adjusted.

III. FGGE III-b data set format and contents

The parameters available in the GFDL/FGGE data set are sea level pressure, horizontal wind components, temperature, mixing ratio of water vapor, geopotential height, relative humidity of water vapor, vertical sigma velocity and surface horizontal wind stress components. Analyses are available, on a regular latitude/longitude grid of 1.875° resolution in both dimensions, at 19 pressure levels (interpolated from model sigma-levels) with relative humidity and mixing ratio only available up to 300 mb. The archive format is the FGGE level III-b format (GARP, 1978). The two world data centers through which the data can be obtained are:

World Data Center - A for Meteorology
National Climatic Center
Federal Building
Asheville, North Carolina 28801, USA

or

World Data Center - B for Meteorology
All Union Research Inst. for Hydrometeorological Information
6 Koroles Street
Obninsk, Kaluga District
U.S.S.R. 249020

This booklet contains analyses for March 1979 through May 1979. Each day at 00GMT, four levels of polar stereographic maps of the northern and southern hemispheres (geopotential height at 500 mb, 300 mb, 500 mb, and sea level pressure), as well as two levels (200 mb and 850 mb) of tropical streamlines and isotachs, are presented. The geopotential maps have a contour interval of 8 decameters and the sea level pressure maps an interval of 5 mb with areas of model topography greater than one kilometer shaded. The streamline maps have isotachs with a varying stippling density as described below:

200 mb		850 mb	
no shading	0-15 m/s	no shading	0-5 m/s
light shading	15-30 m/s	light shading	5-10 m/s
medium shading	30-40 m/s	medium shading	10-15 m/s
dark shading	45 m/s	dark shading	15 m/s

IV. References

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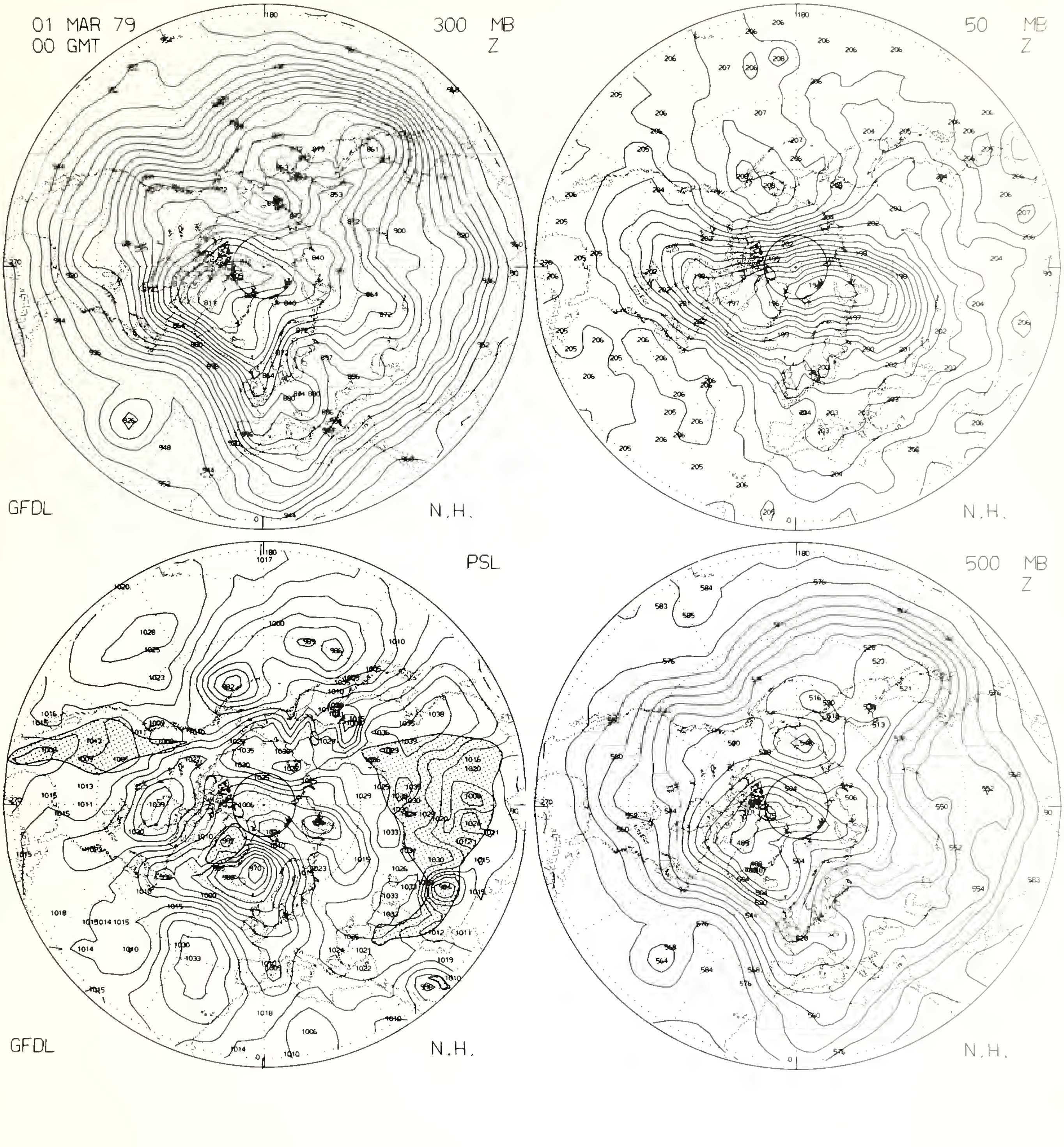
MARCH 1979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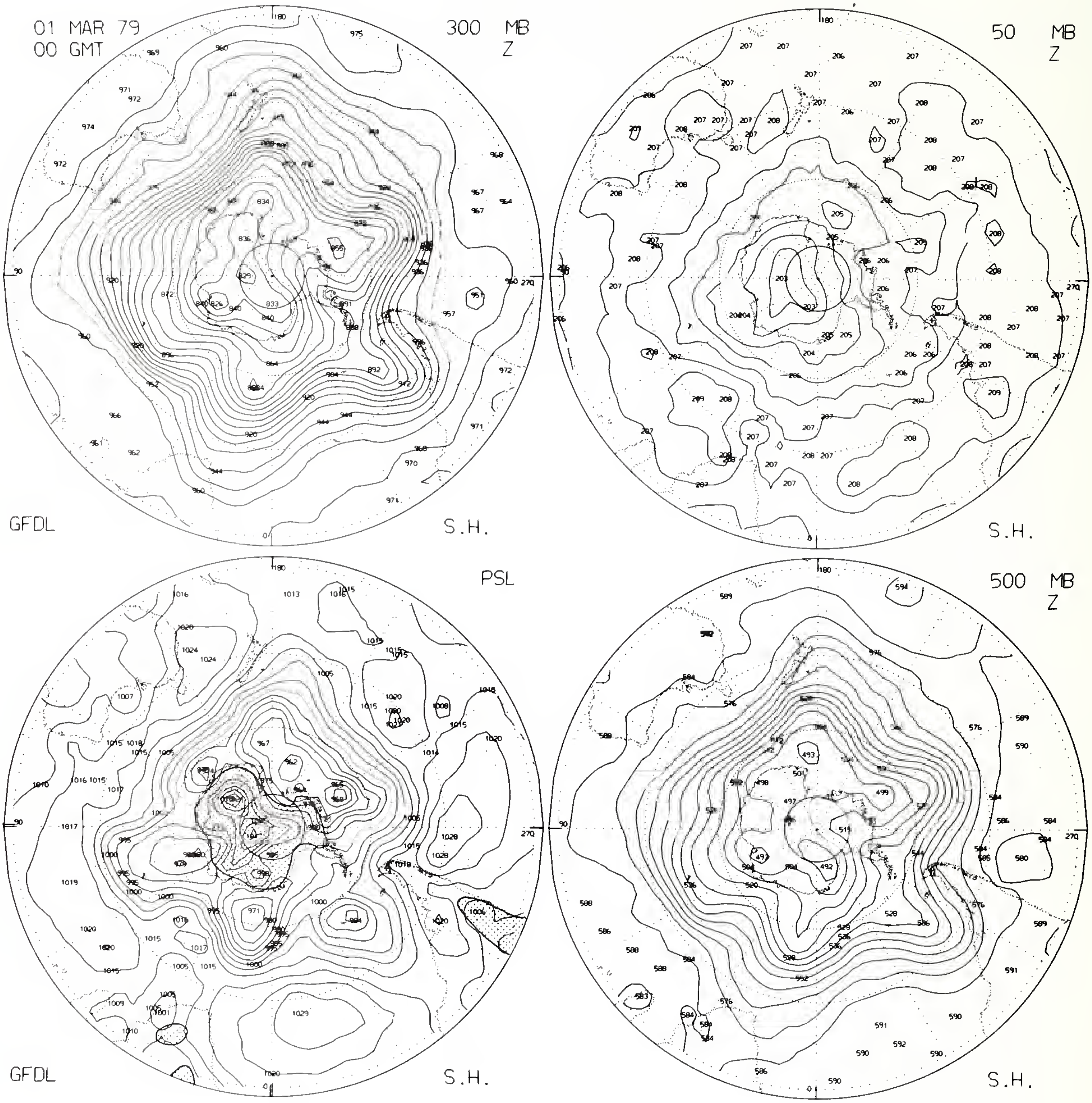
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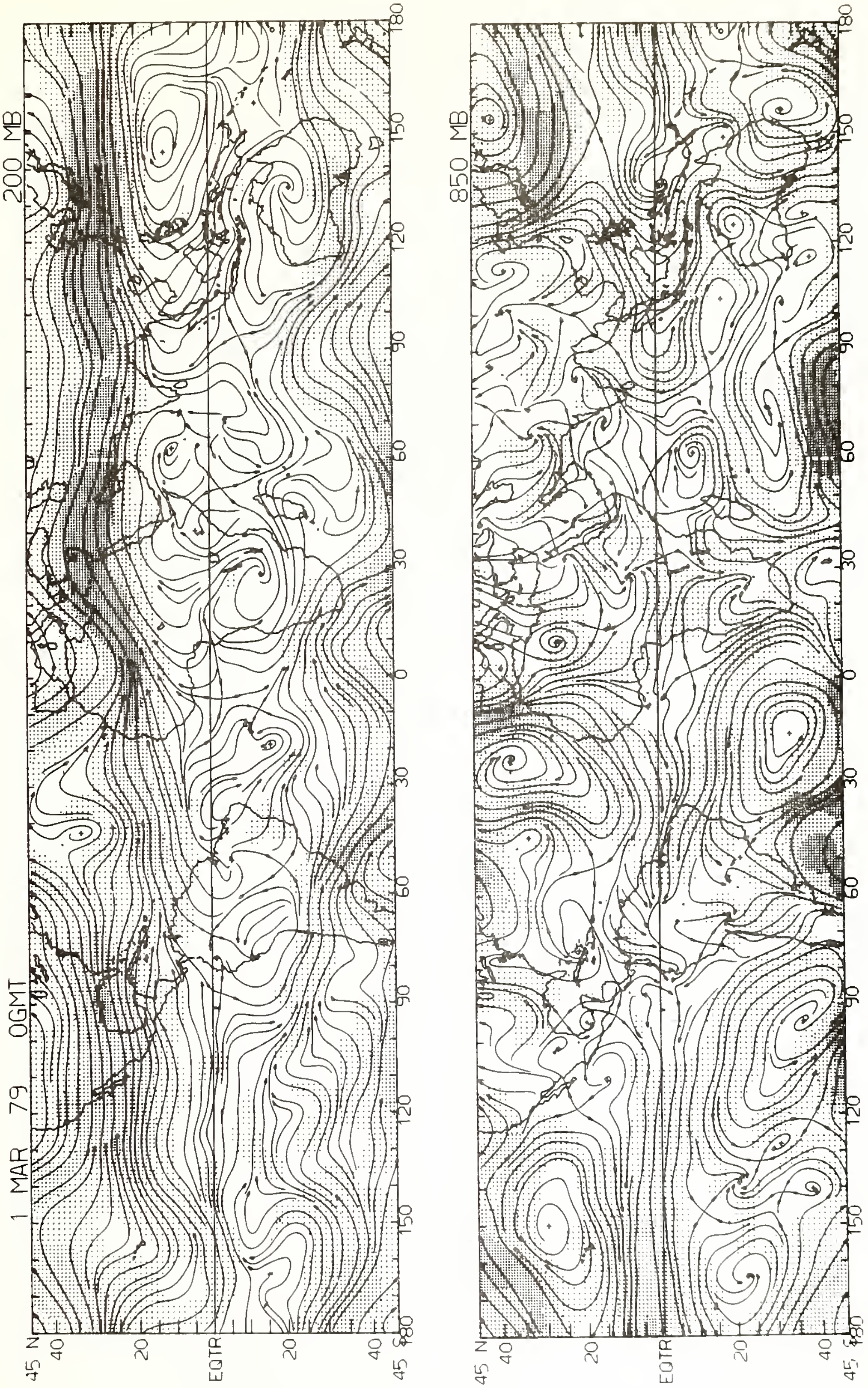
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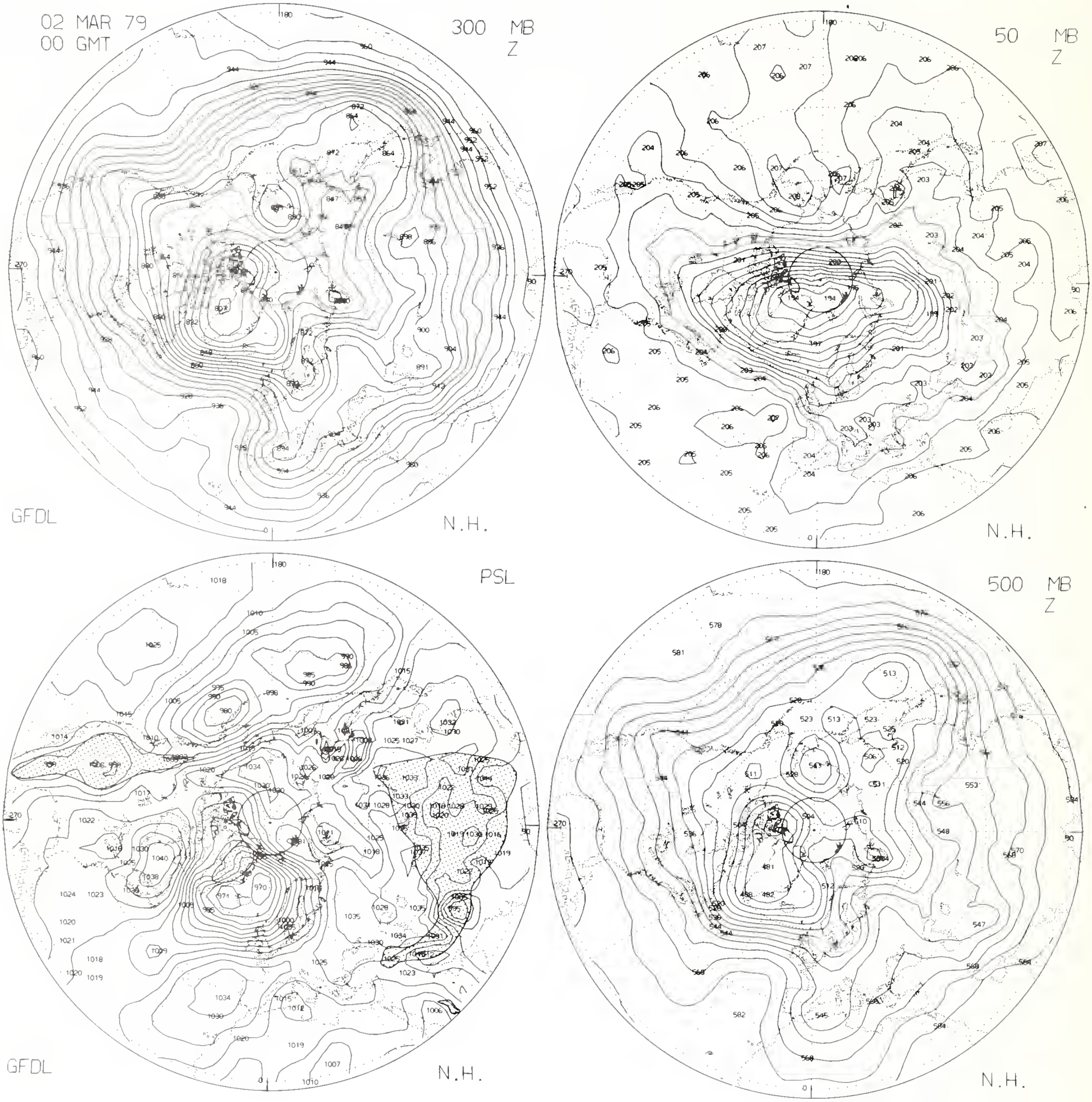
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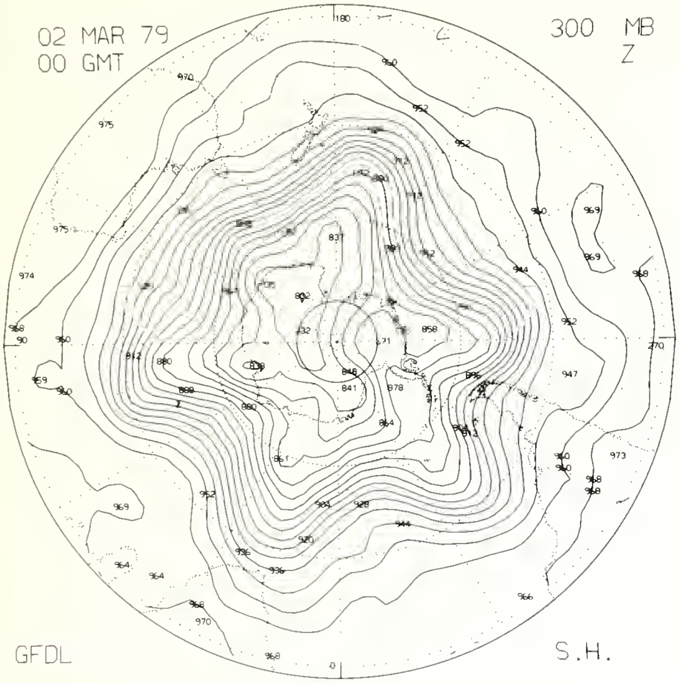
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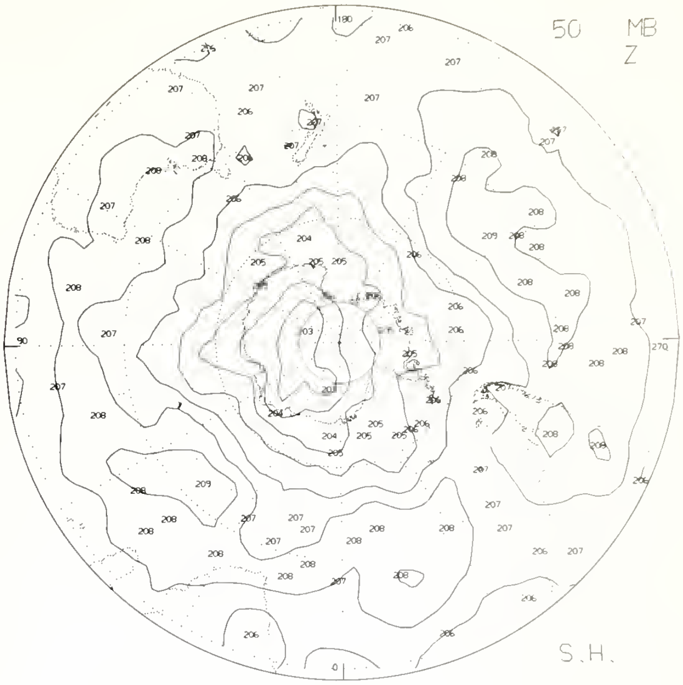
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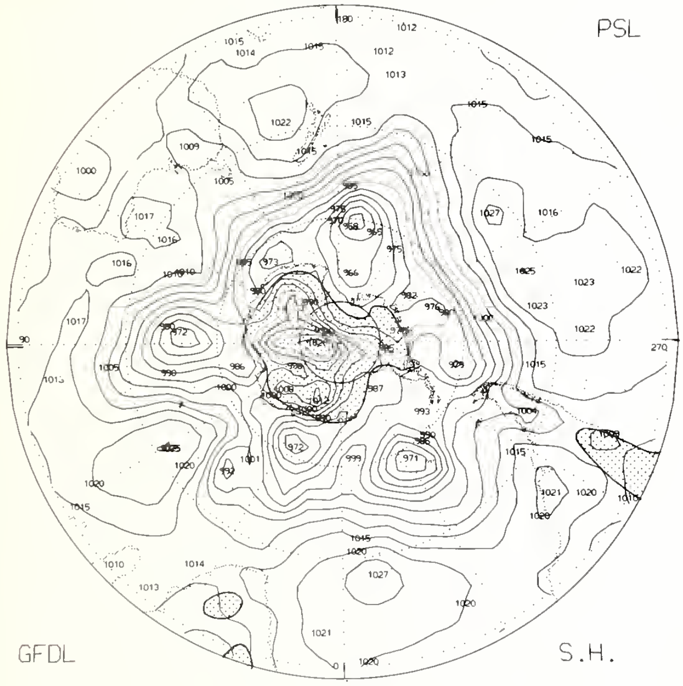
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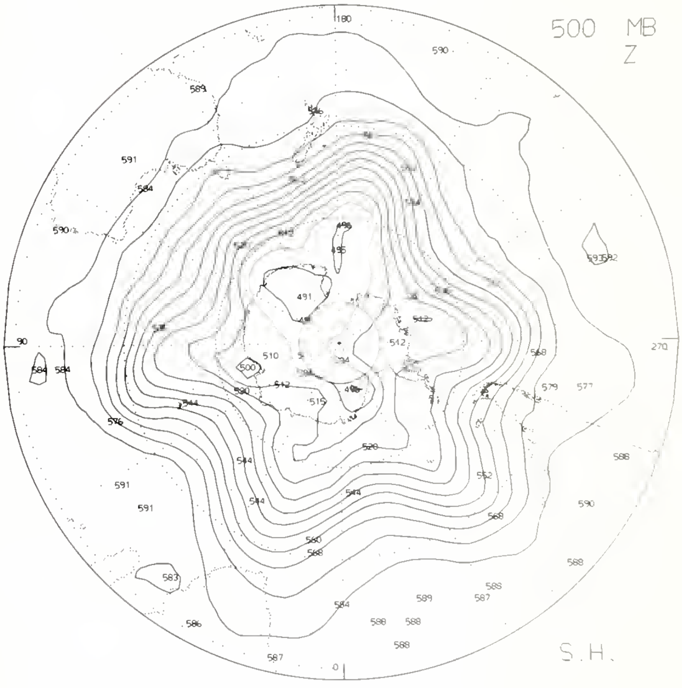
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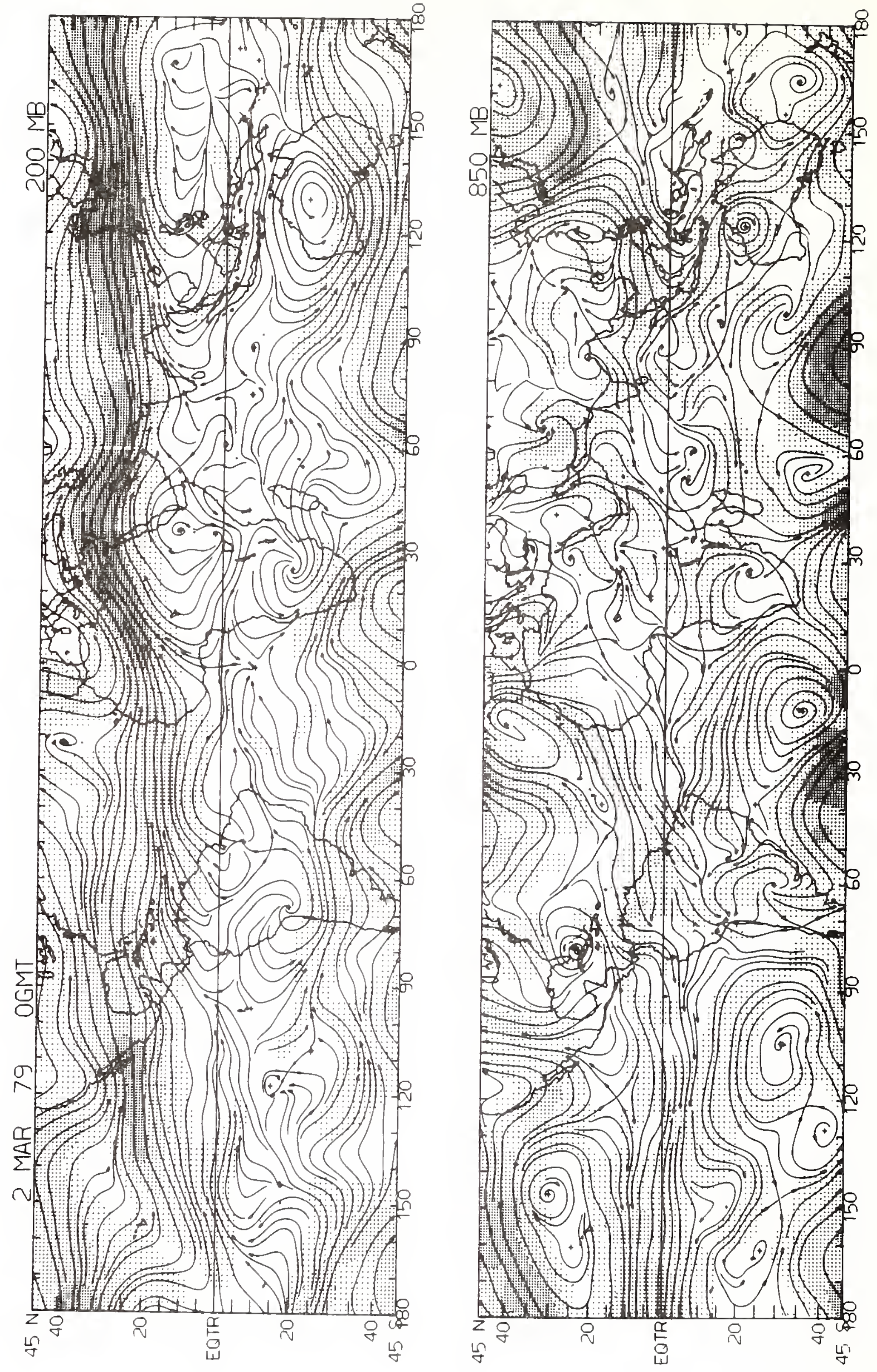
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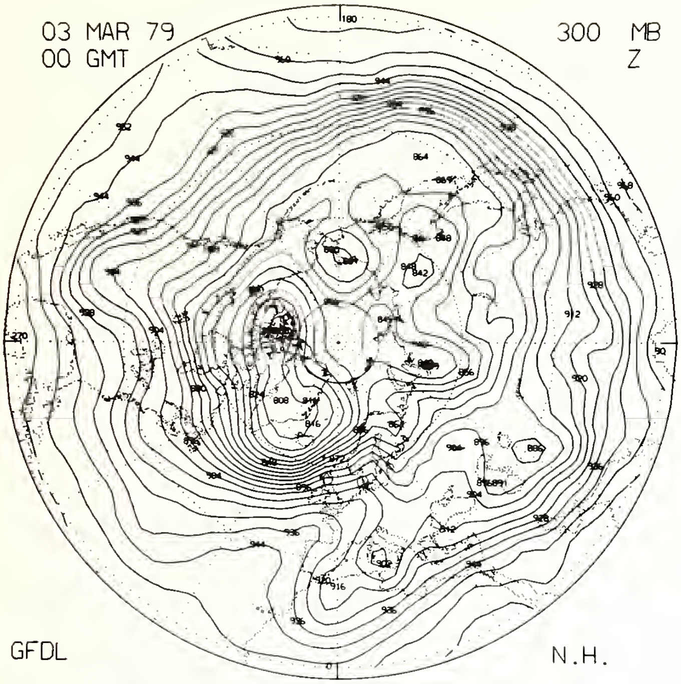
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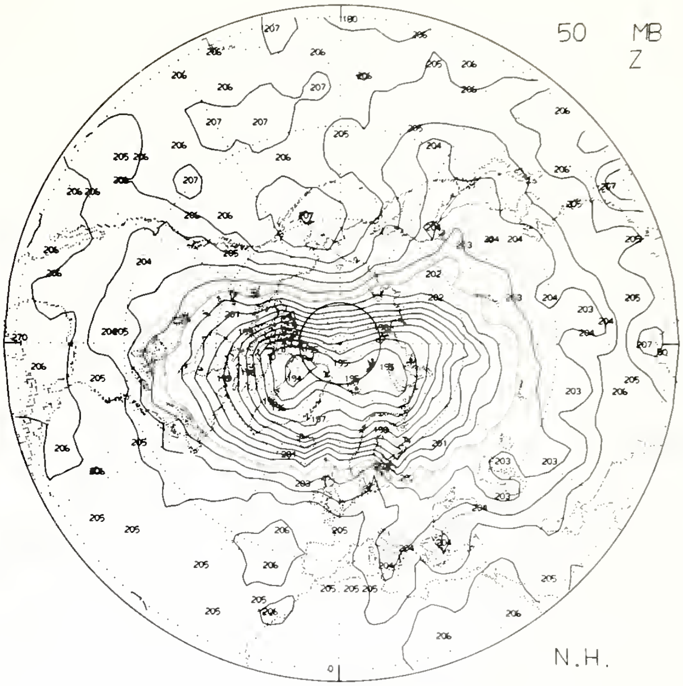
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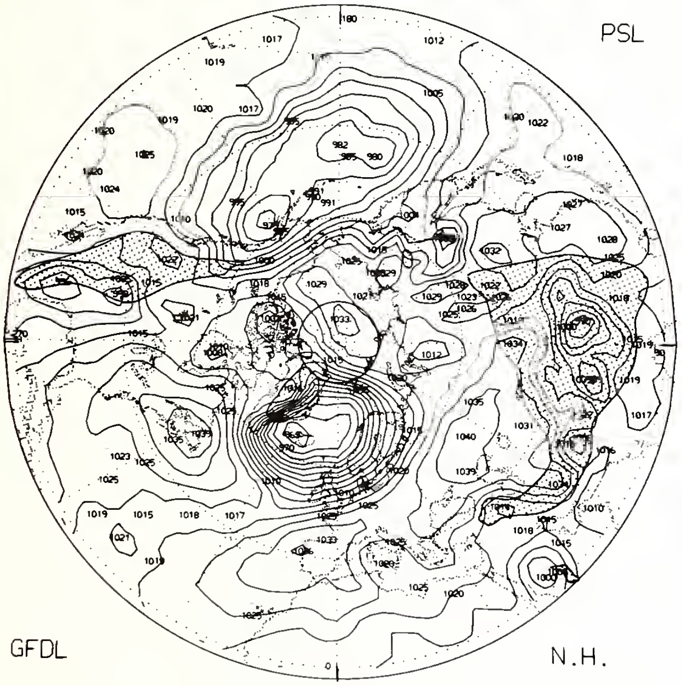
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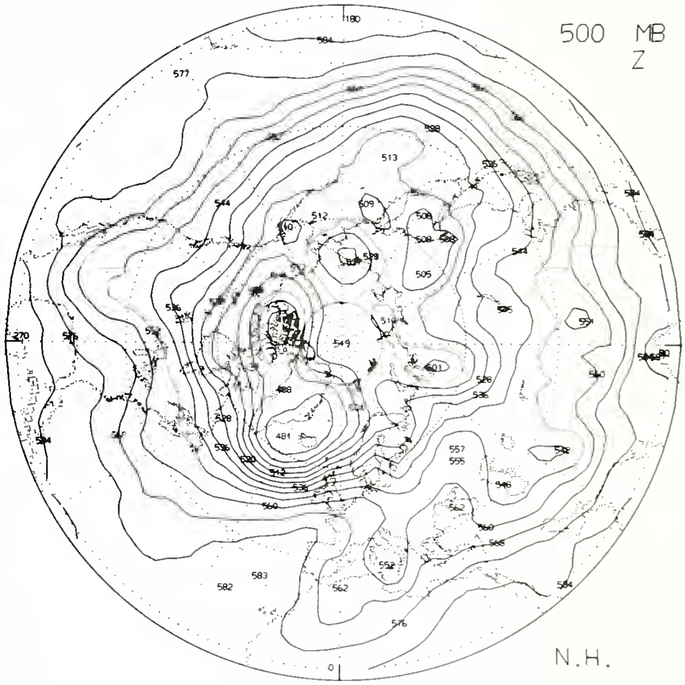
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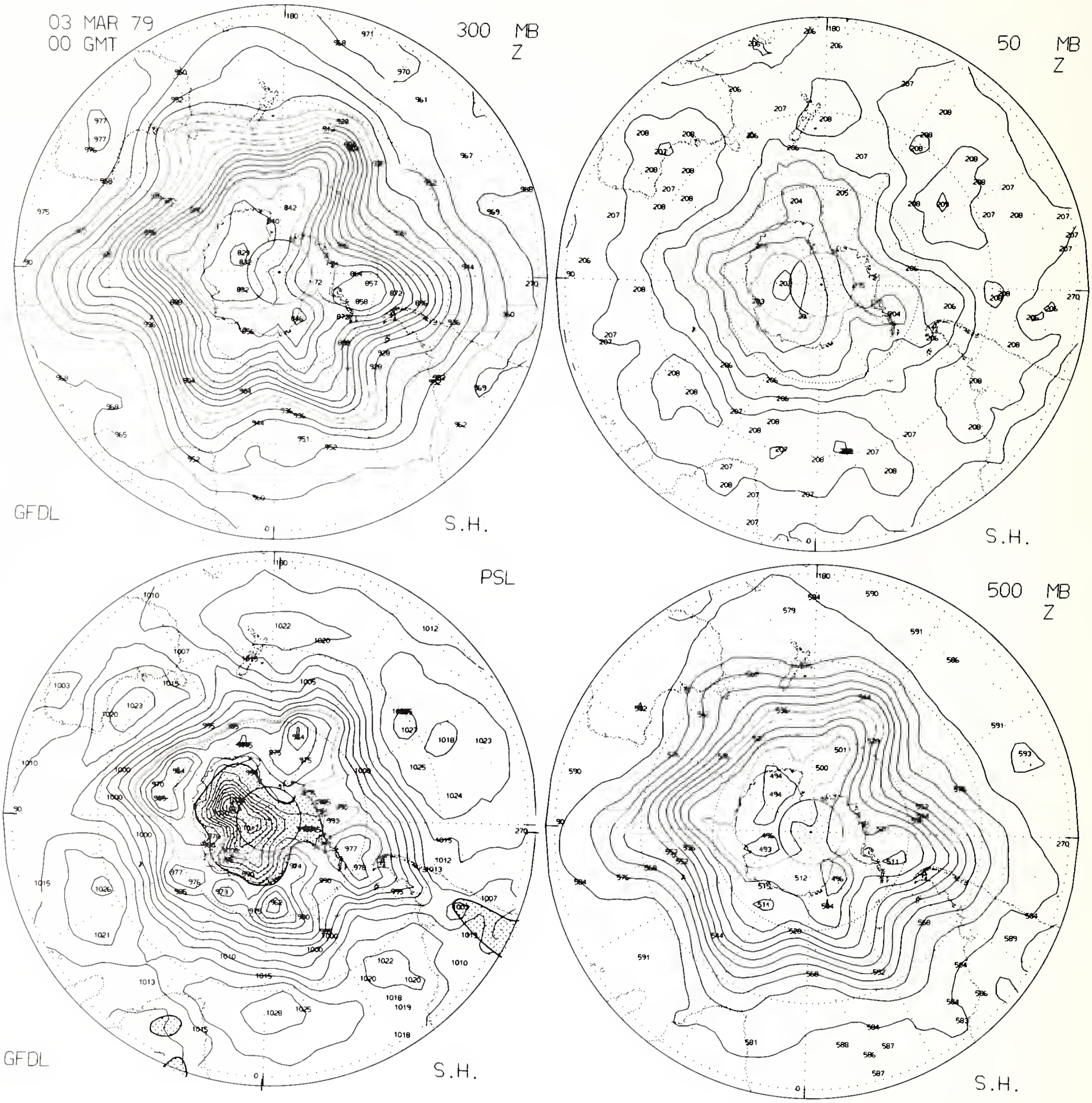
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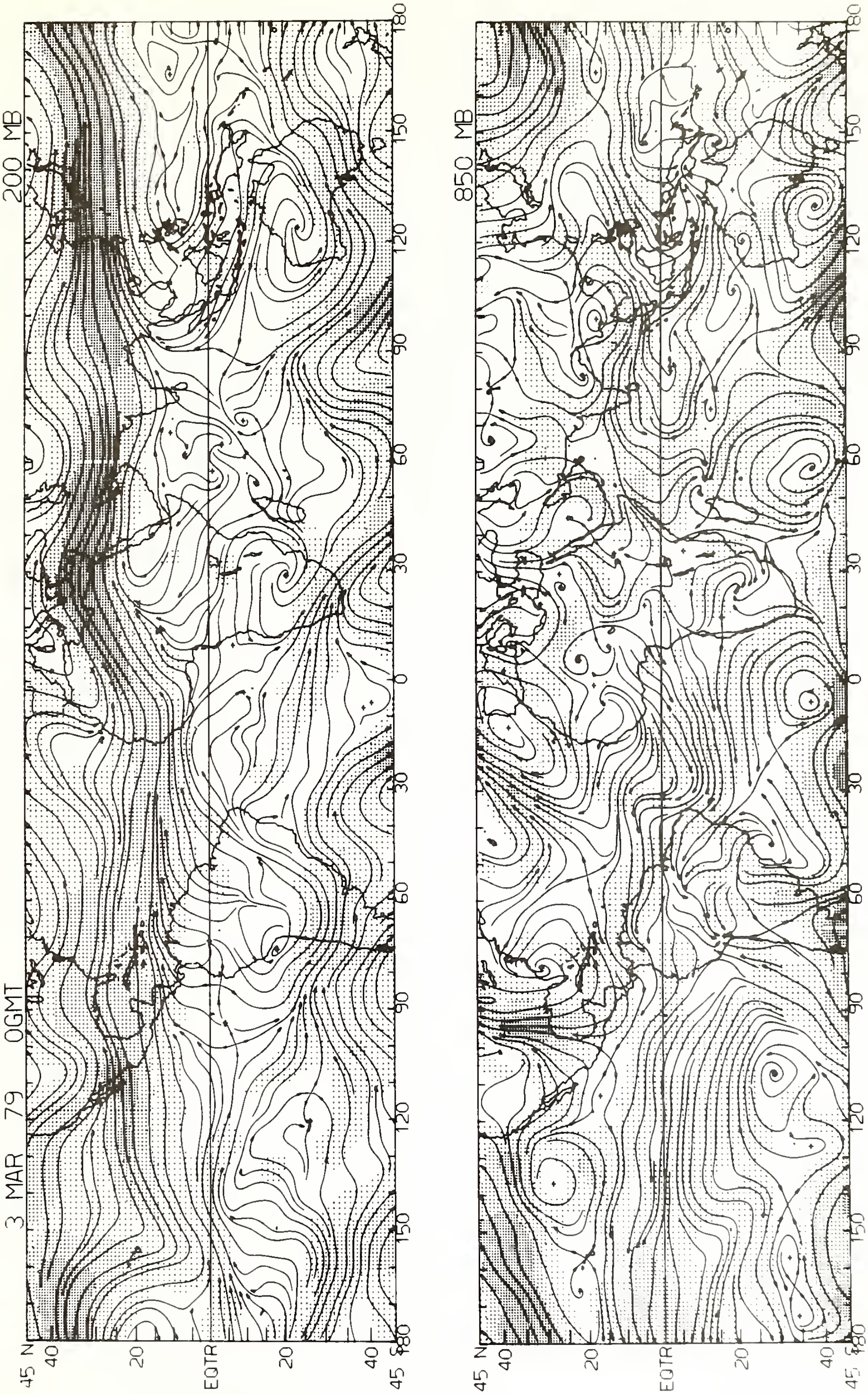
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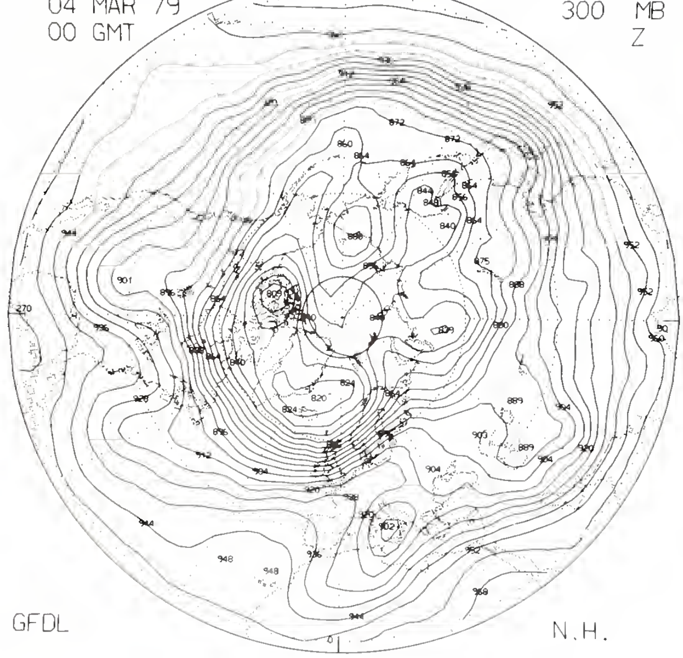
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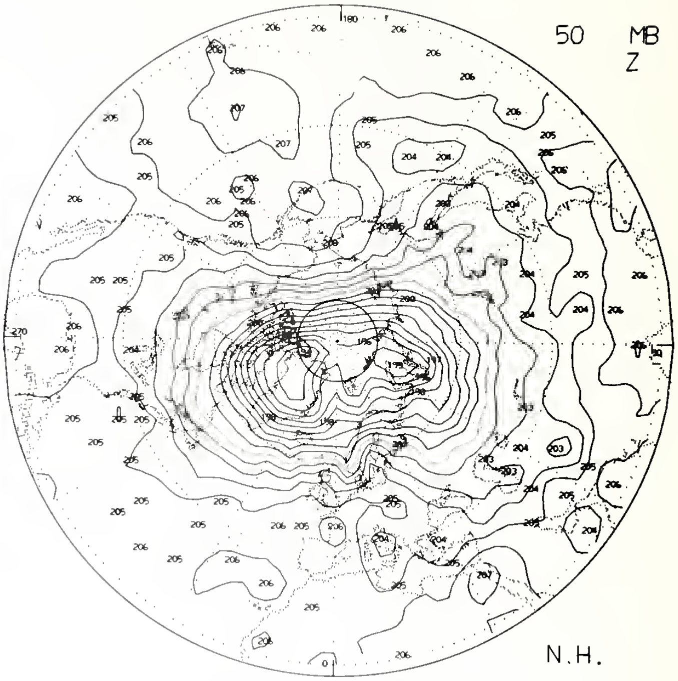
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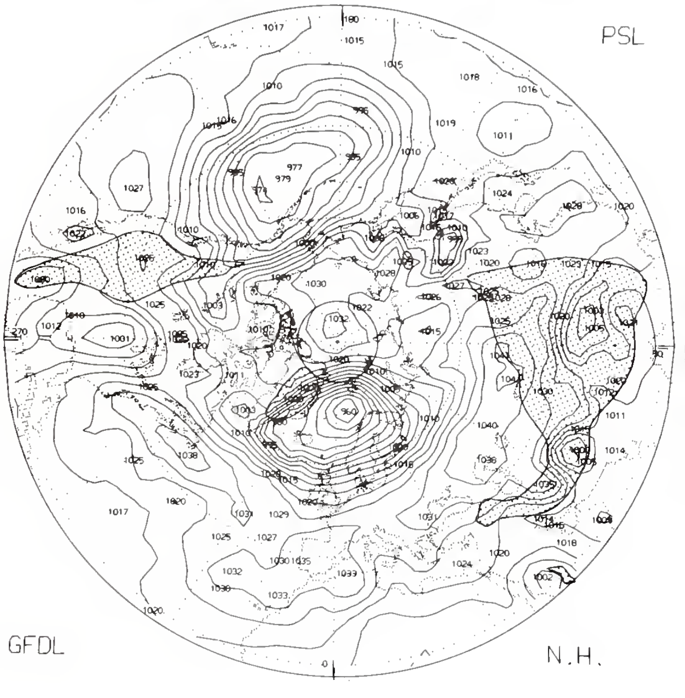
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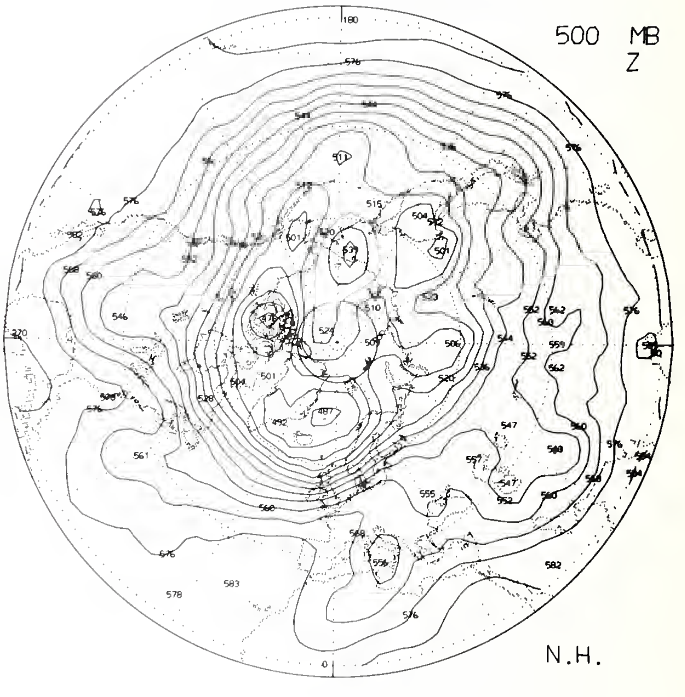
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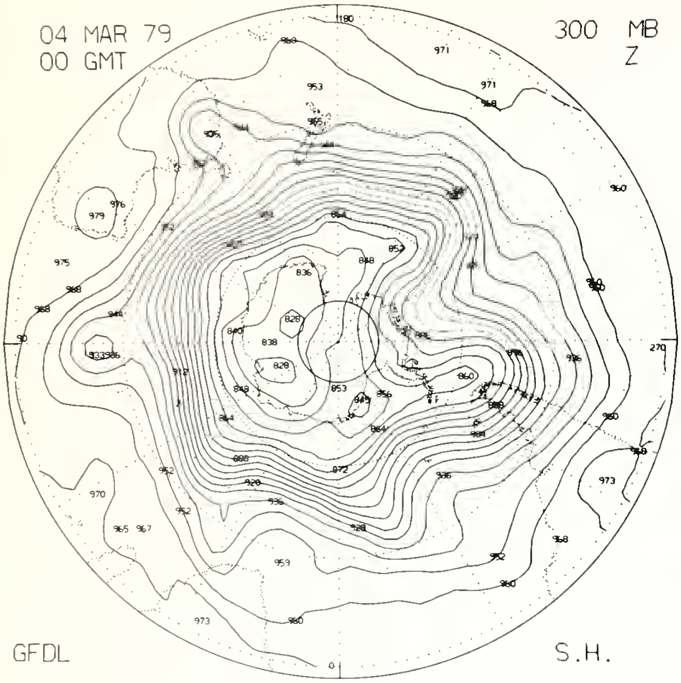
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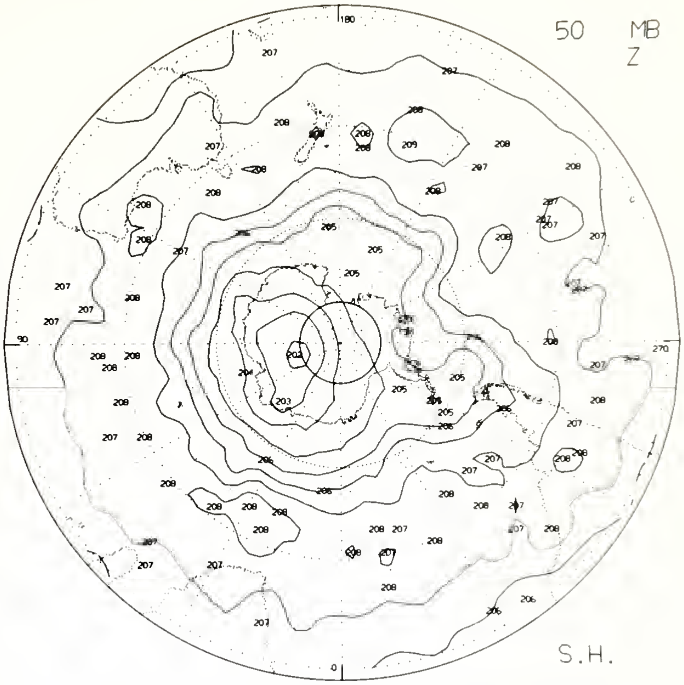
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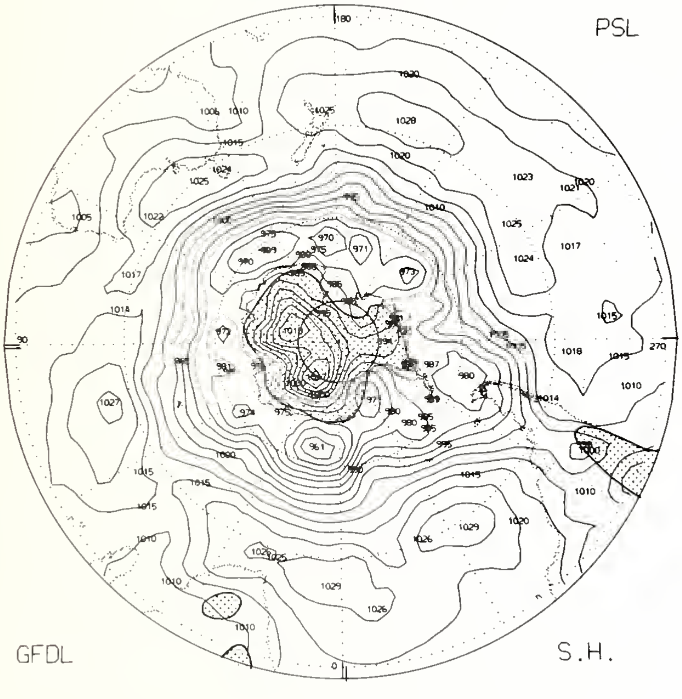
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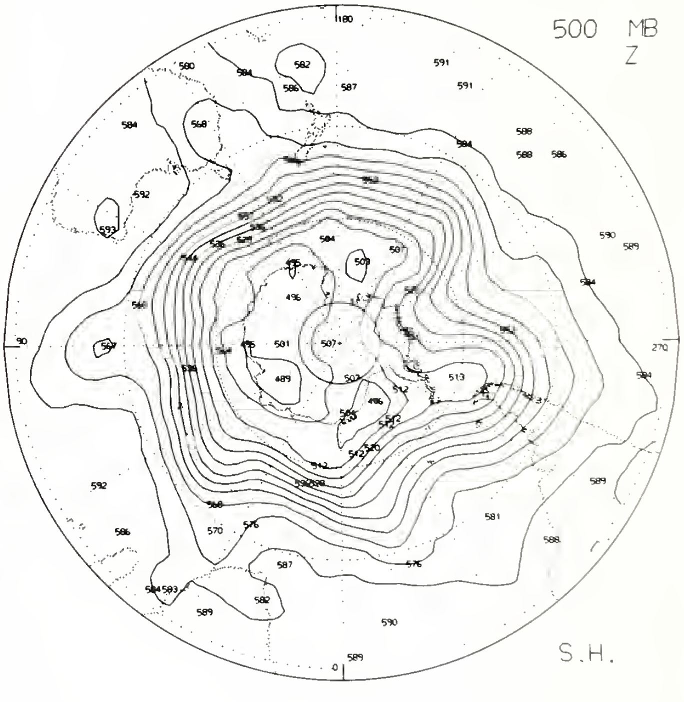
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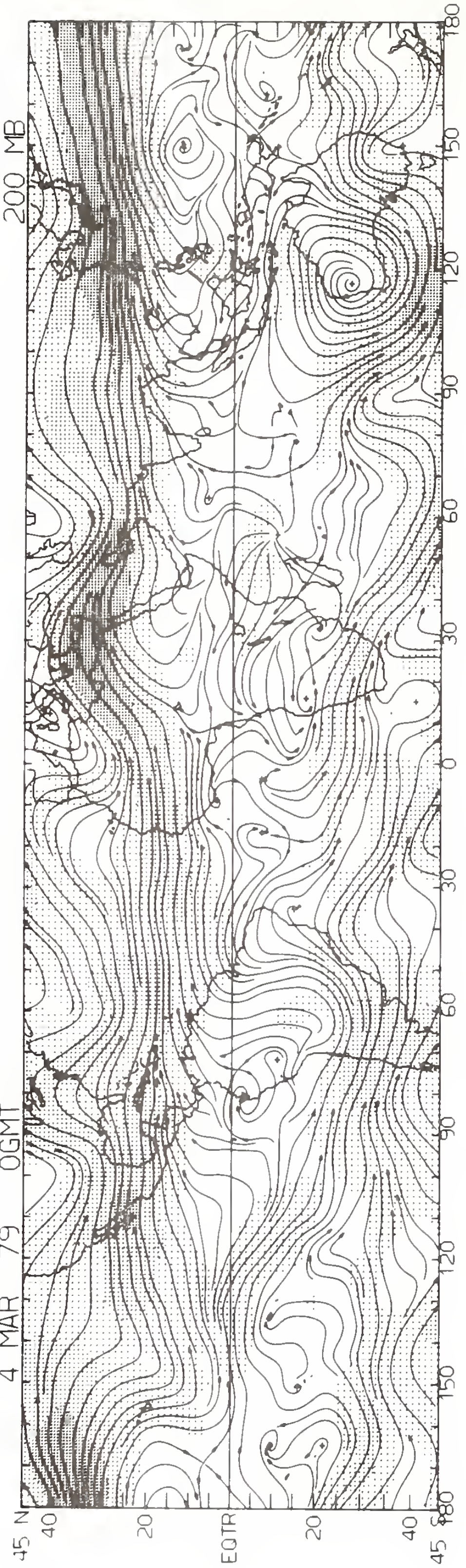
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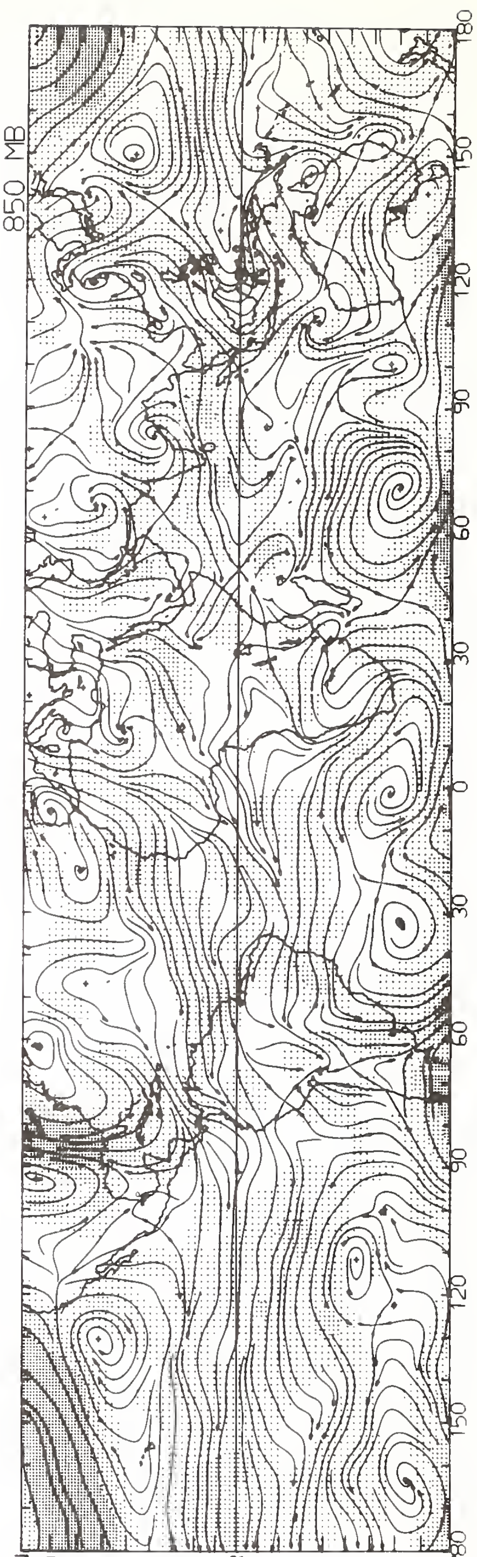
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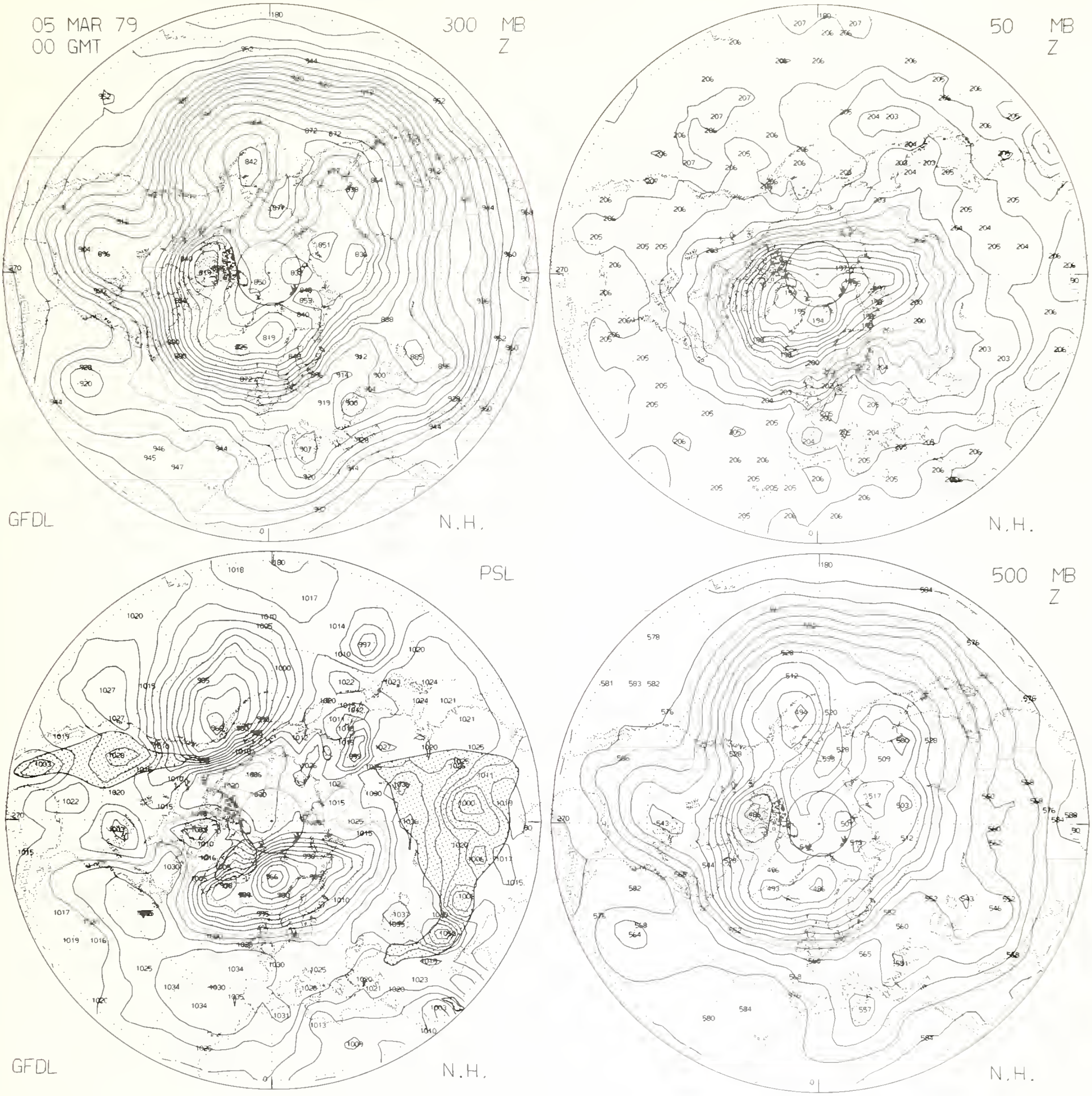
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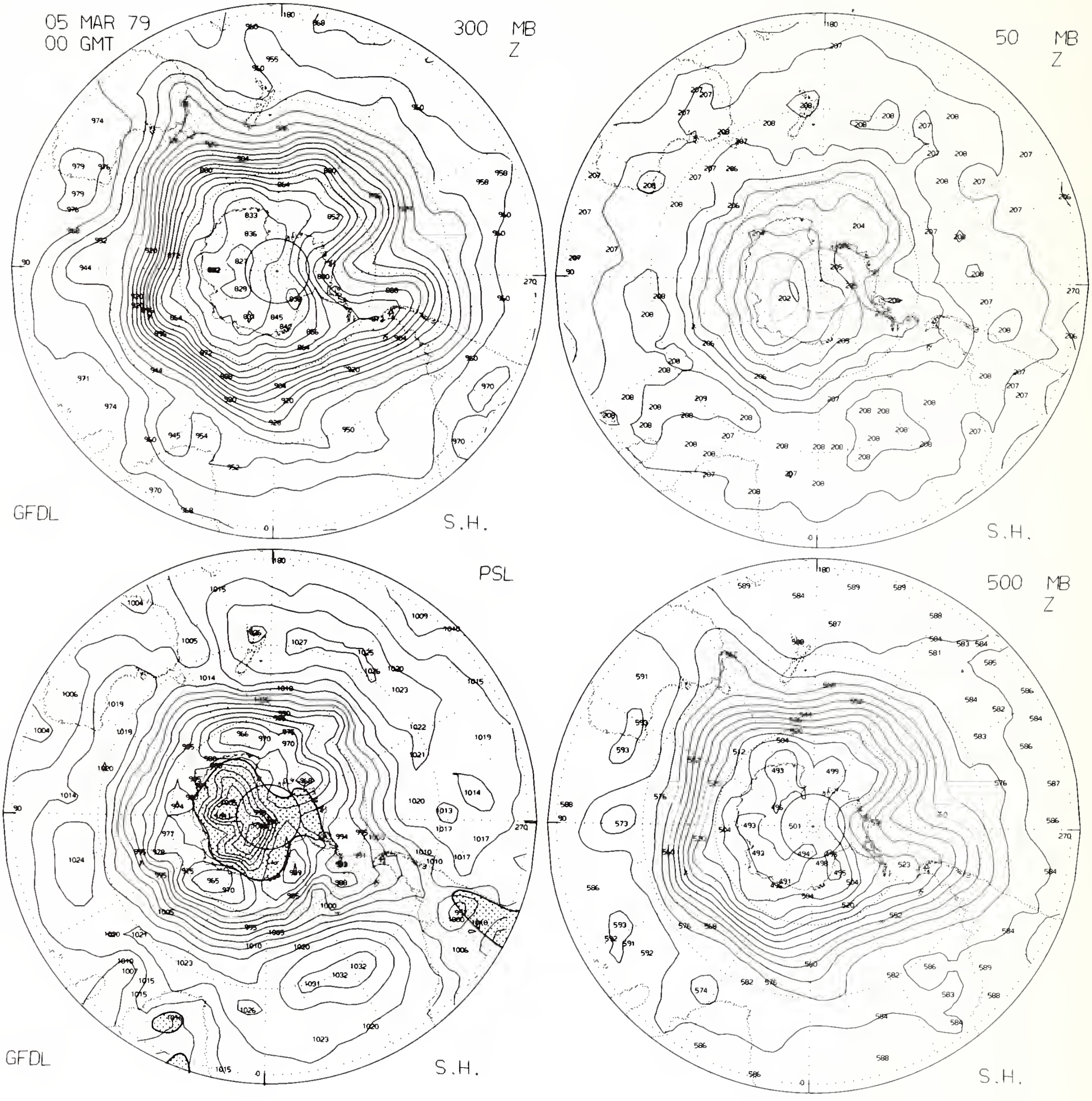
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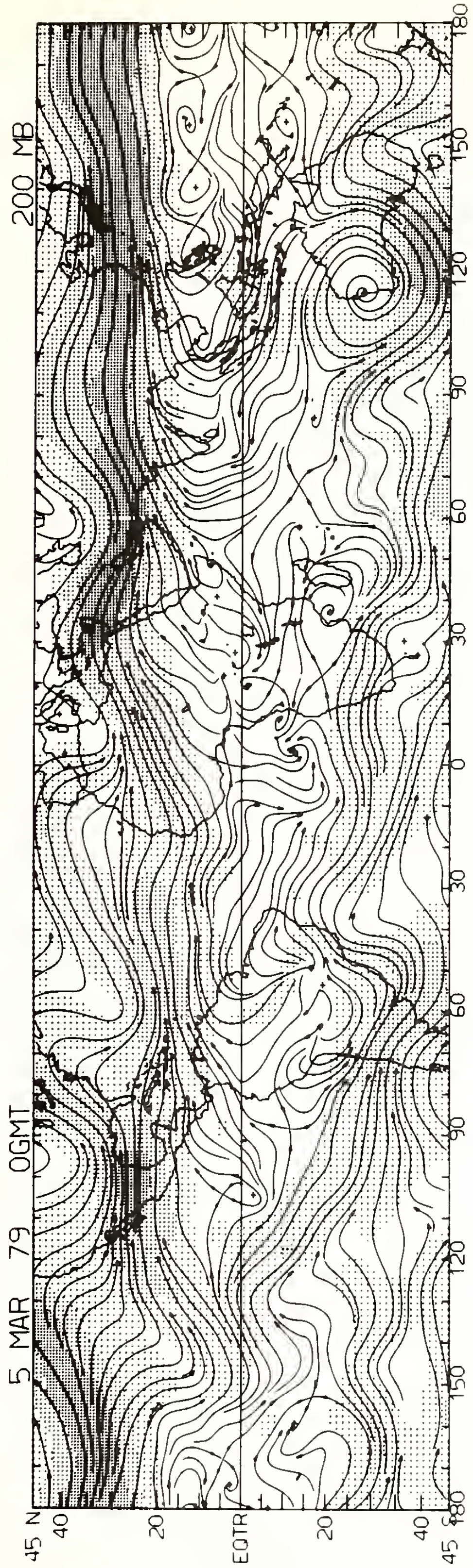
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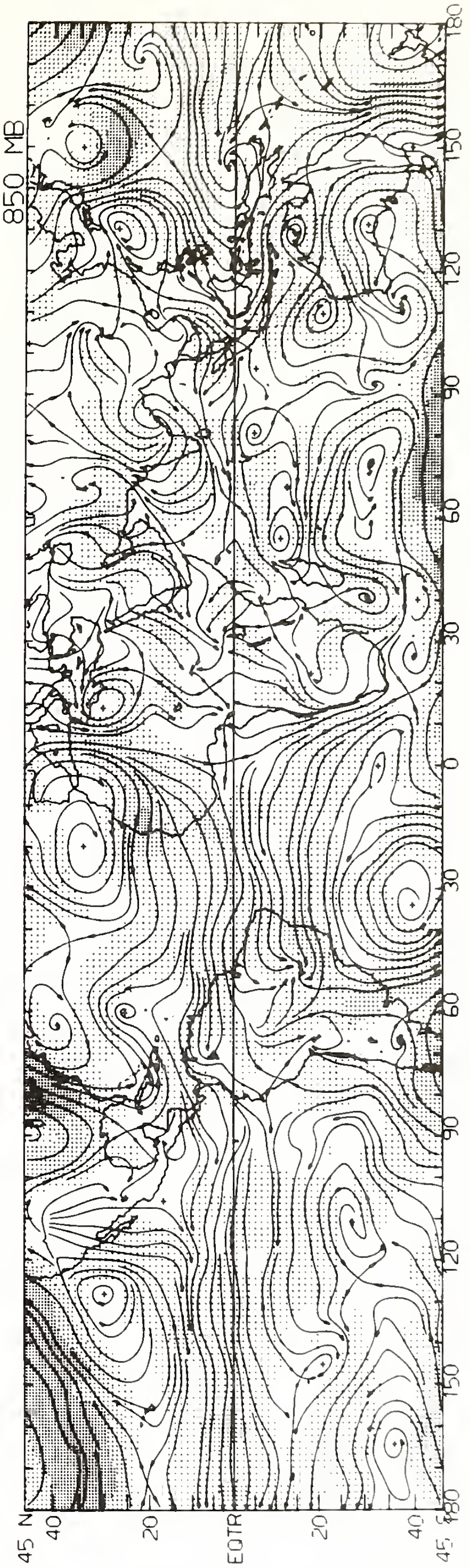
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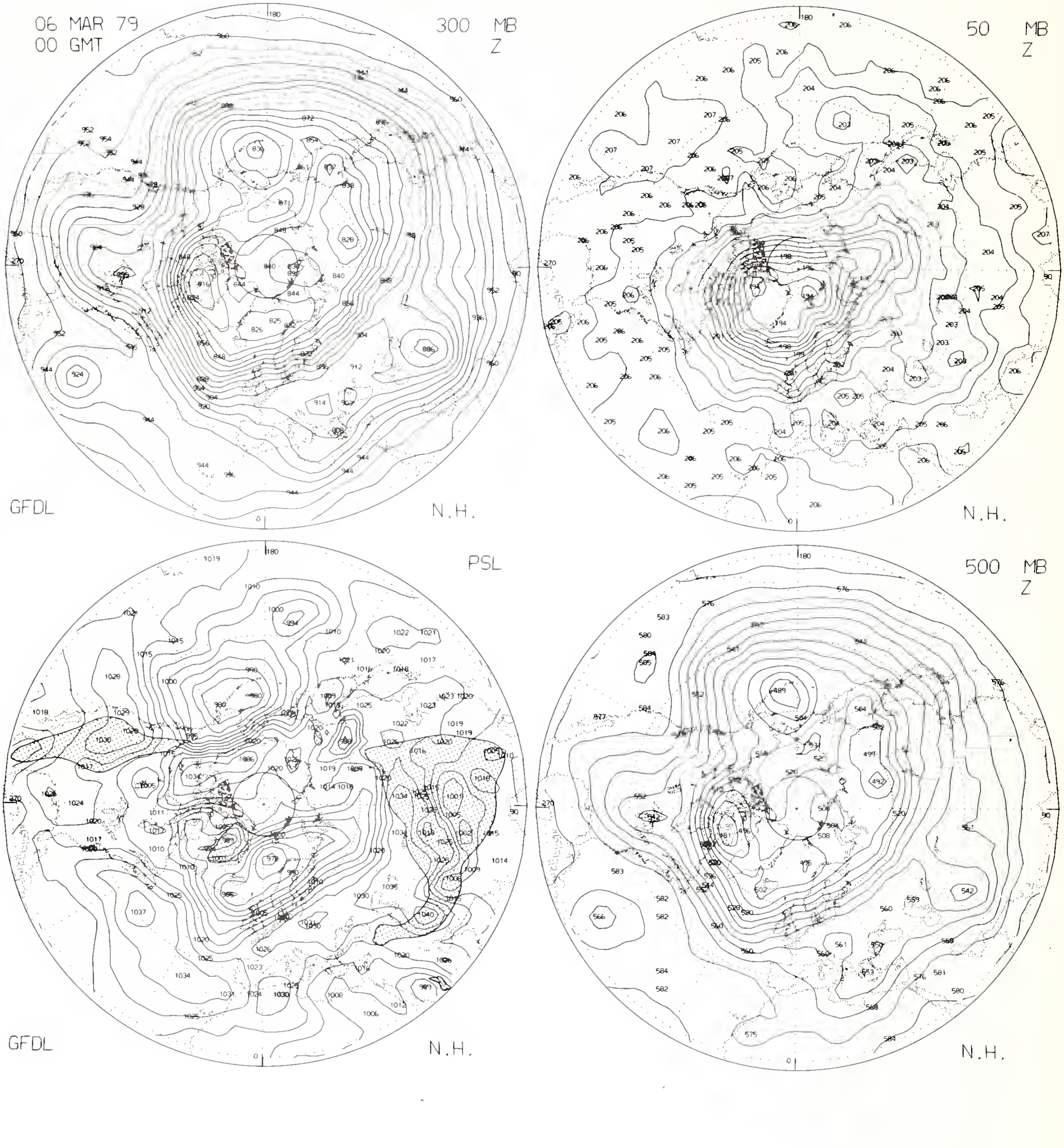
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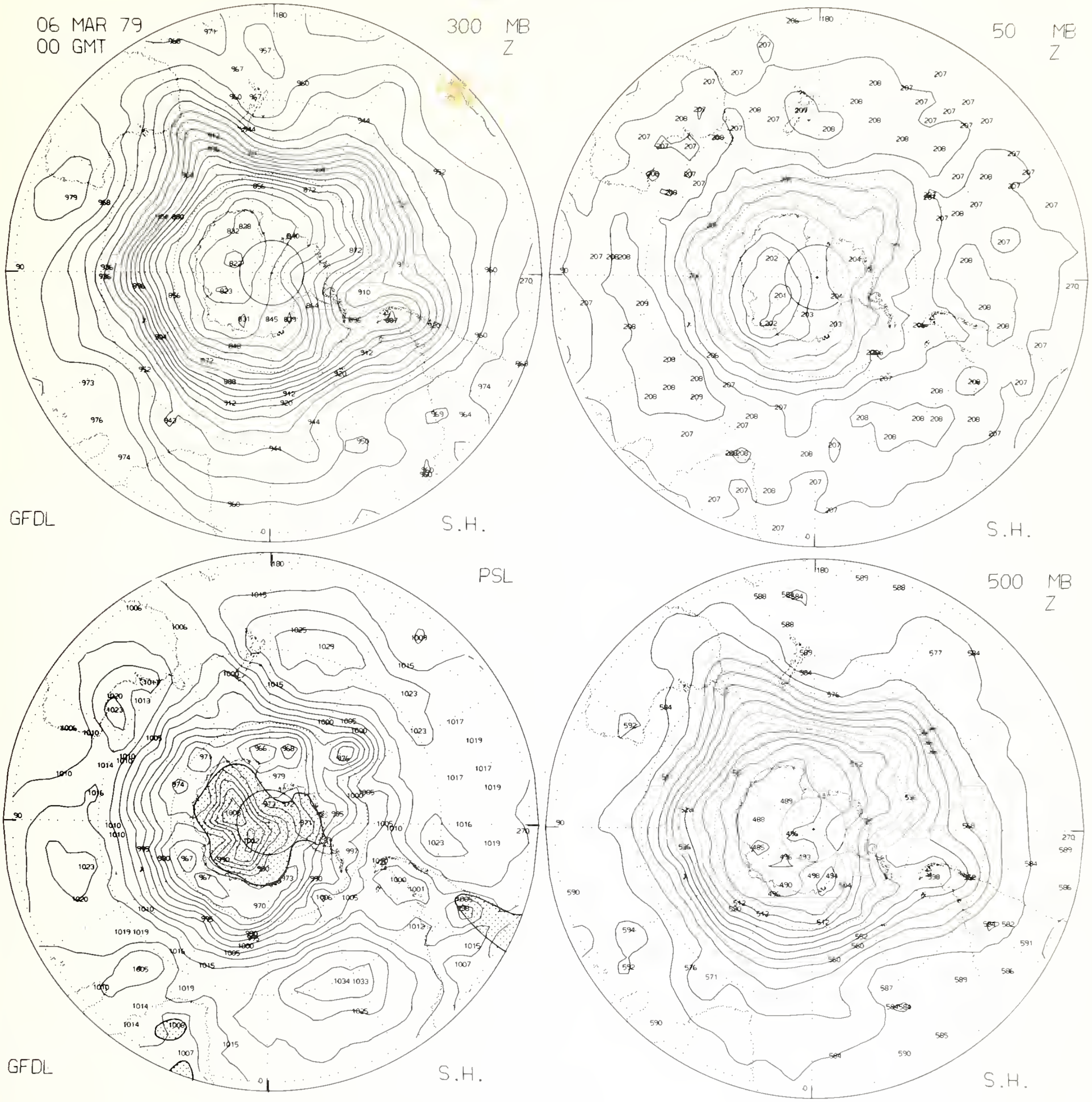
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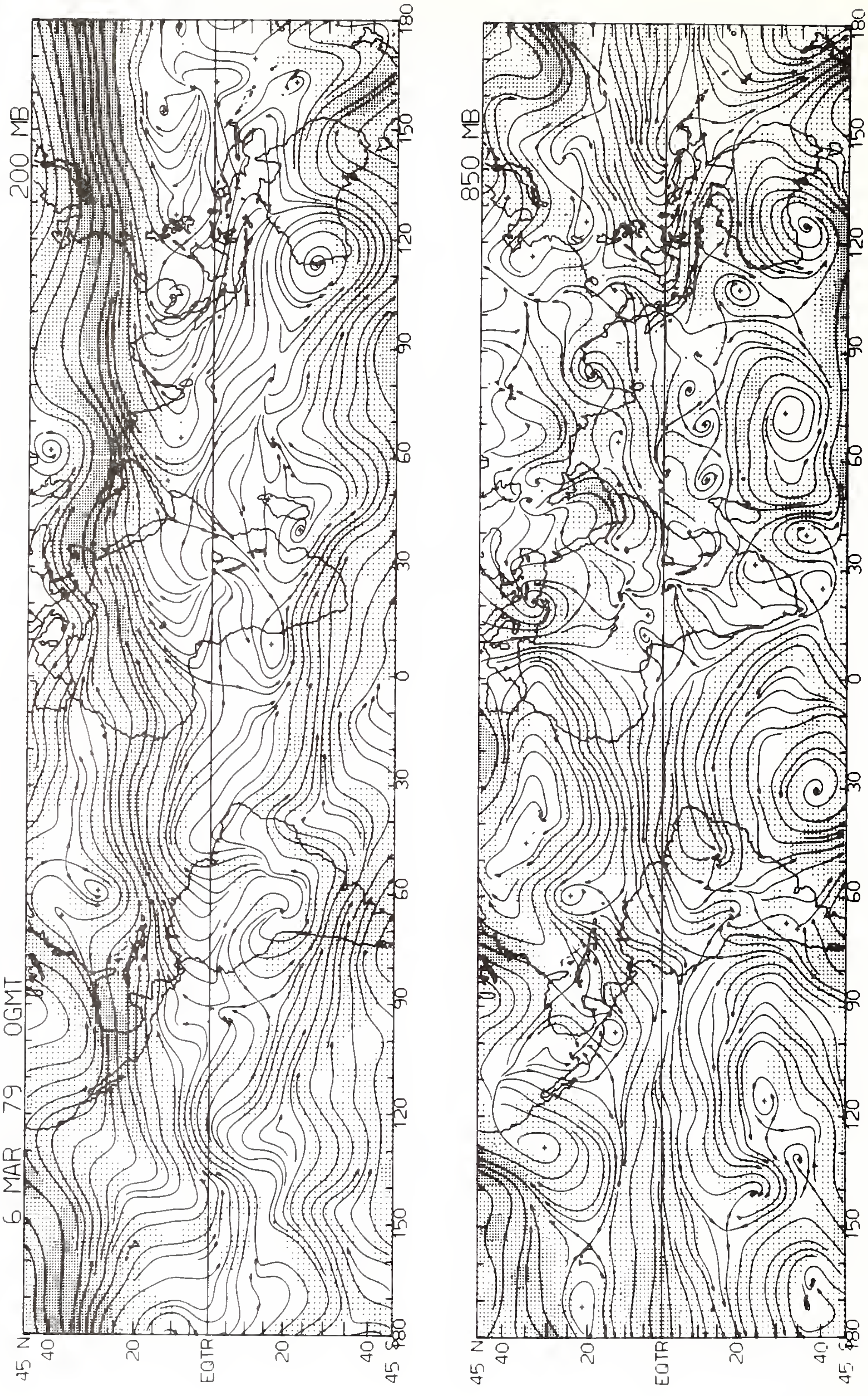
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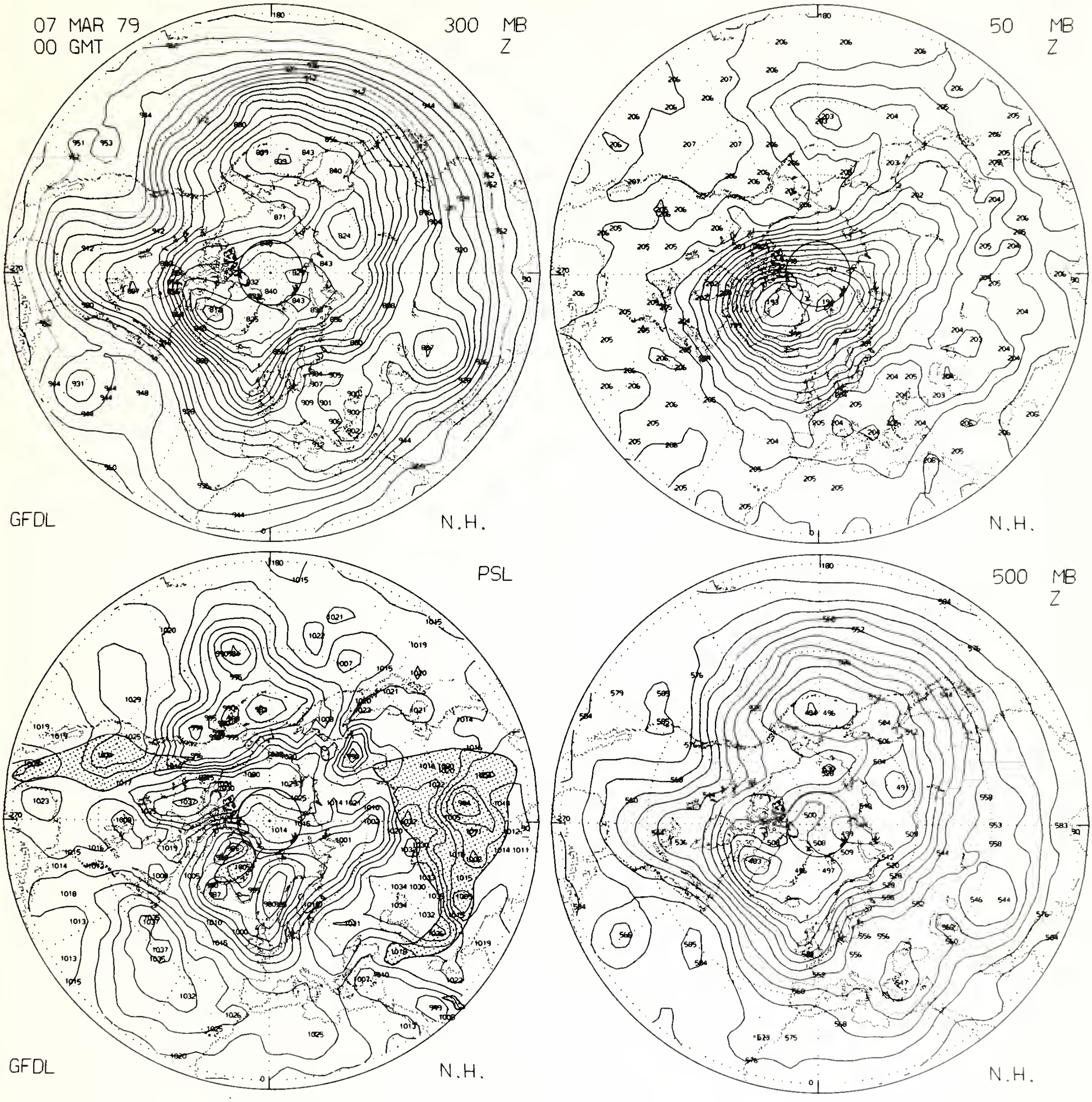
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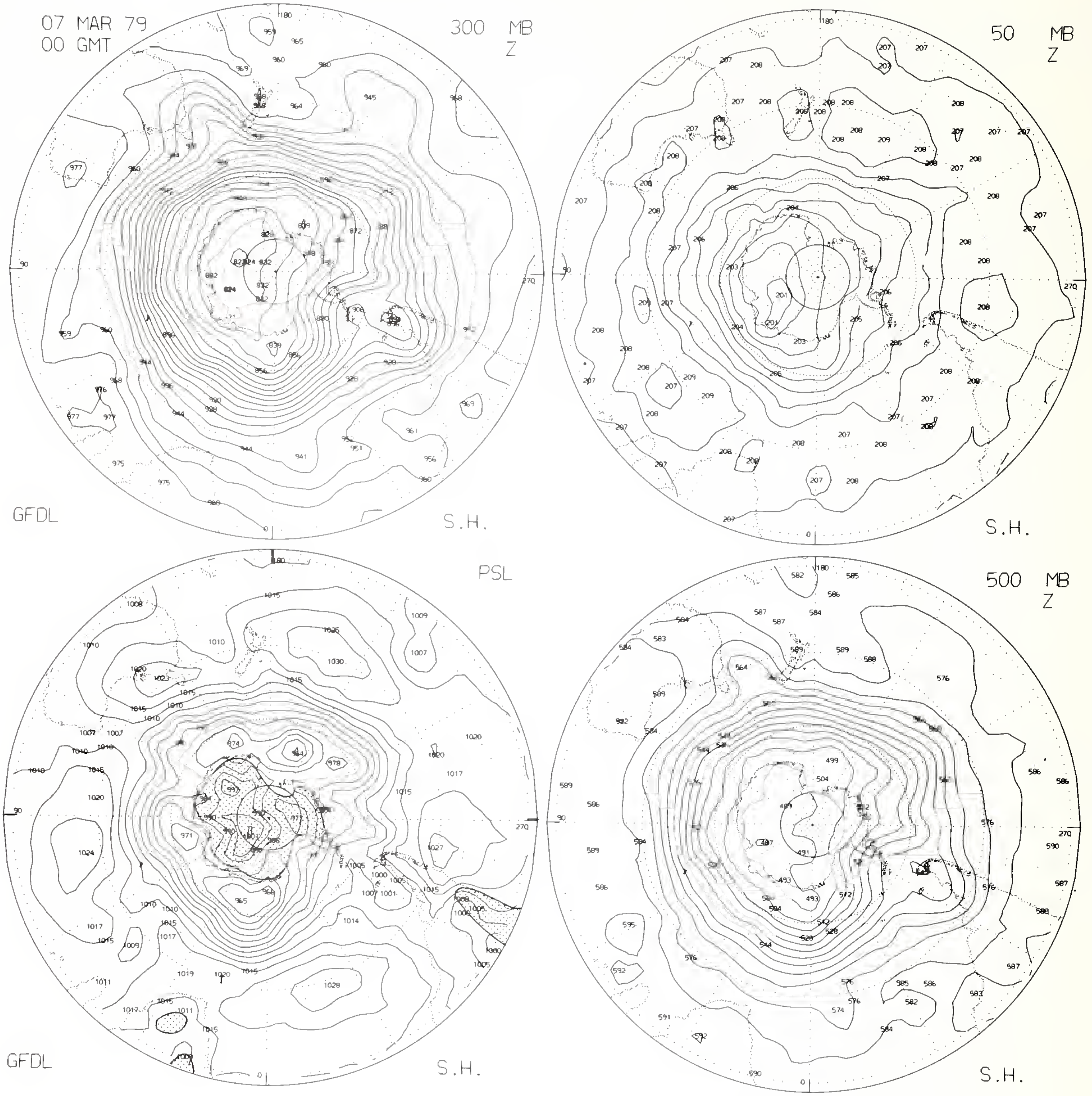
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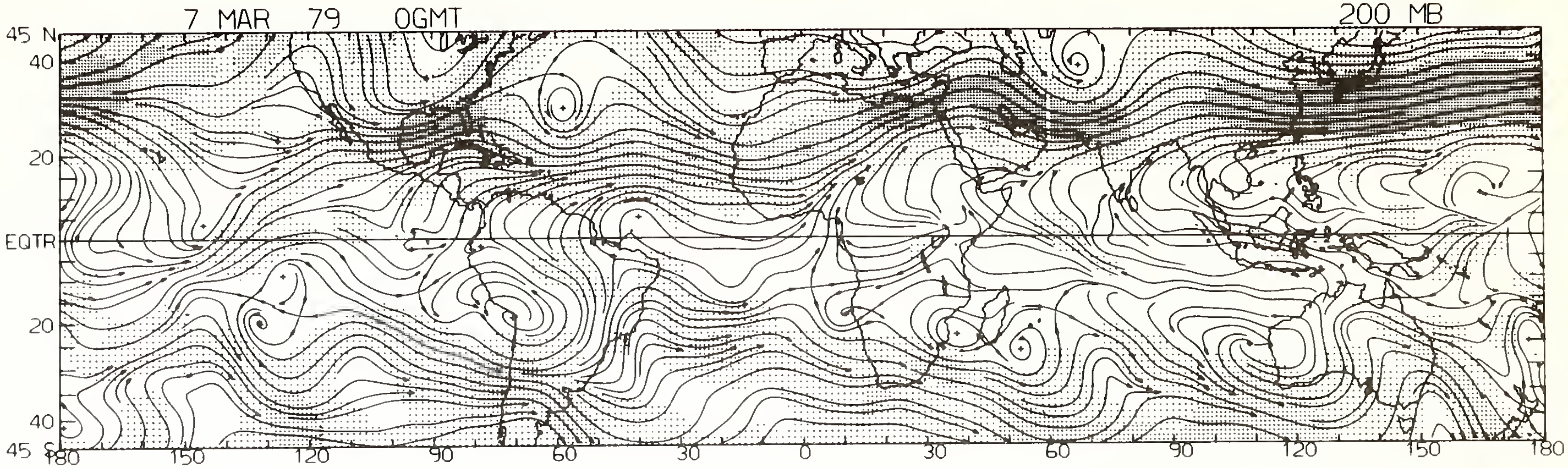
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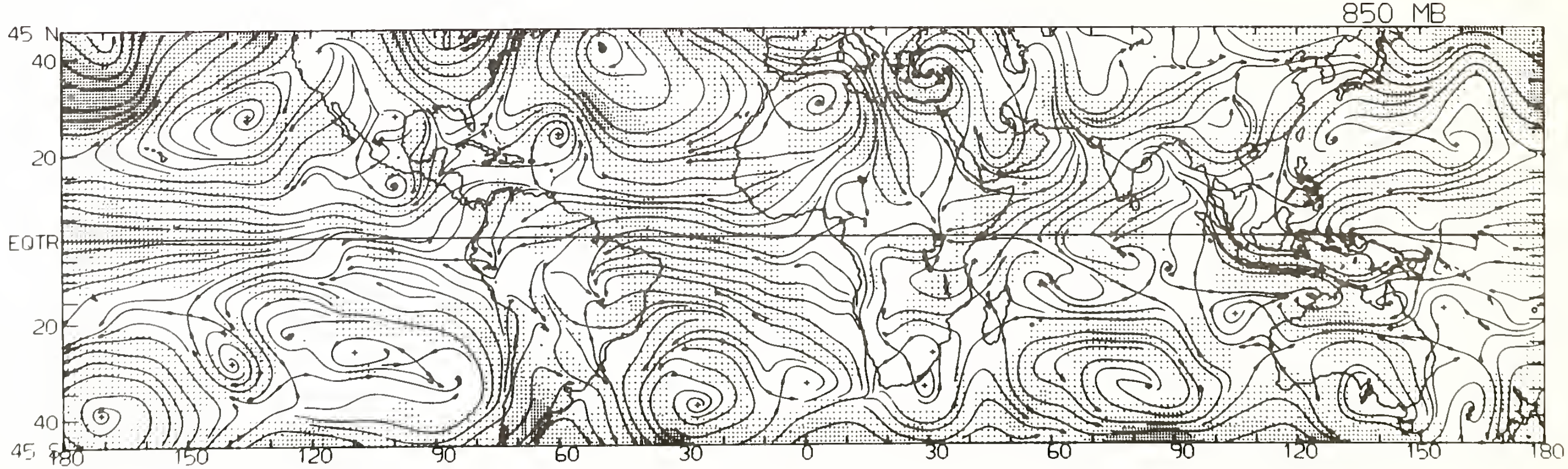
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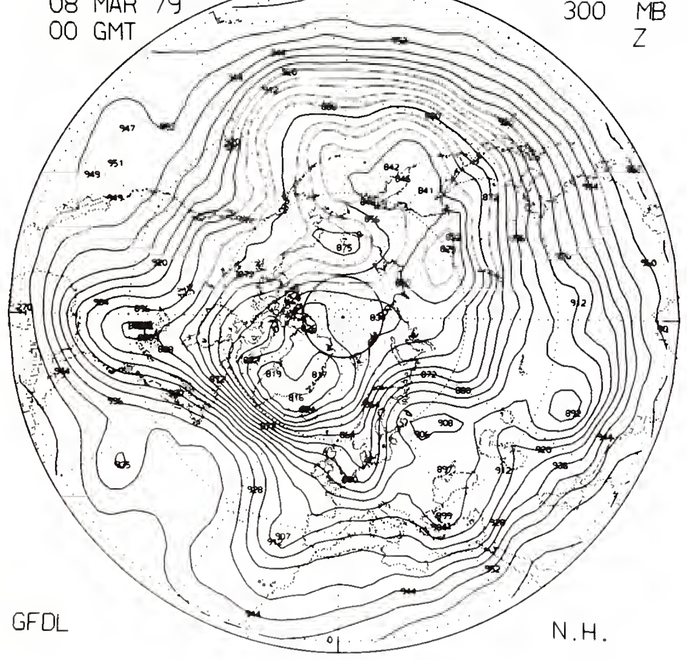
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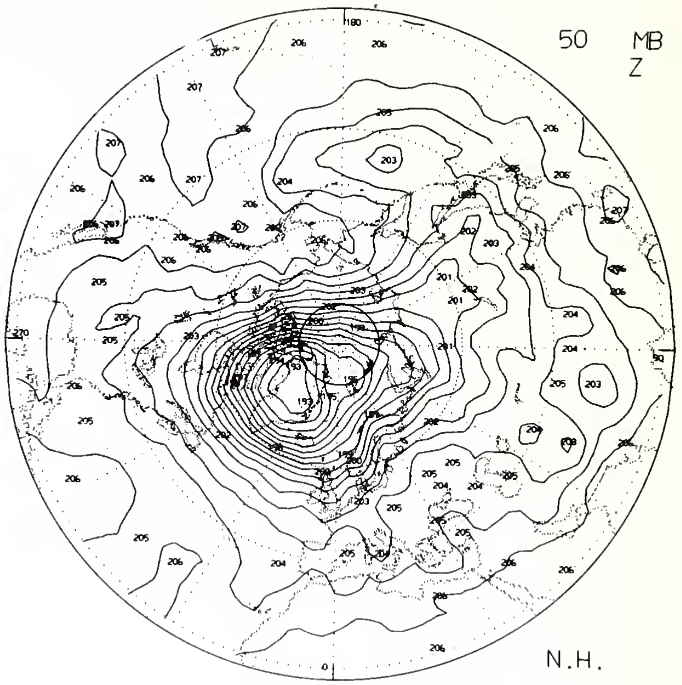
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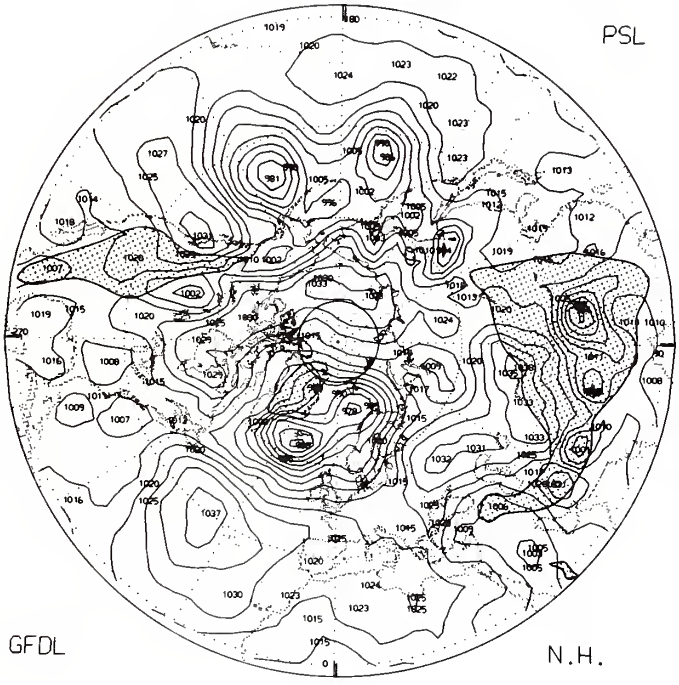
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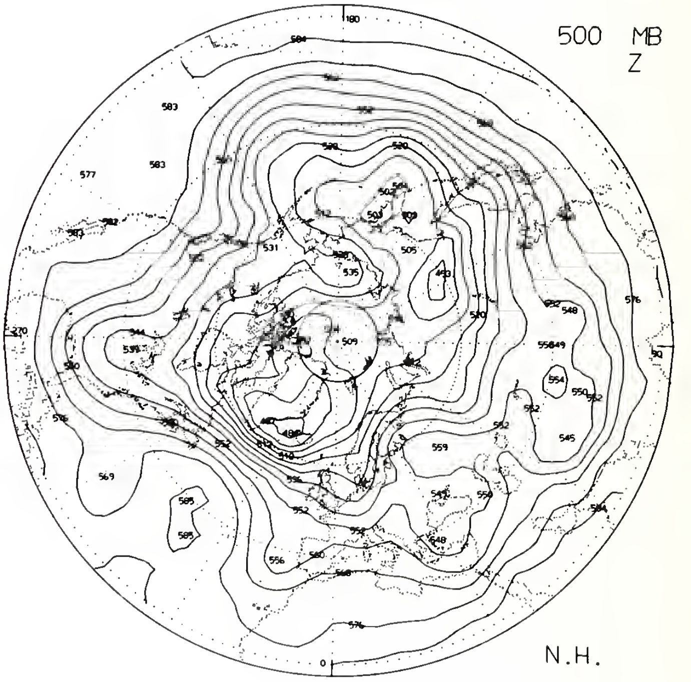
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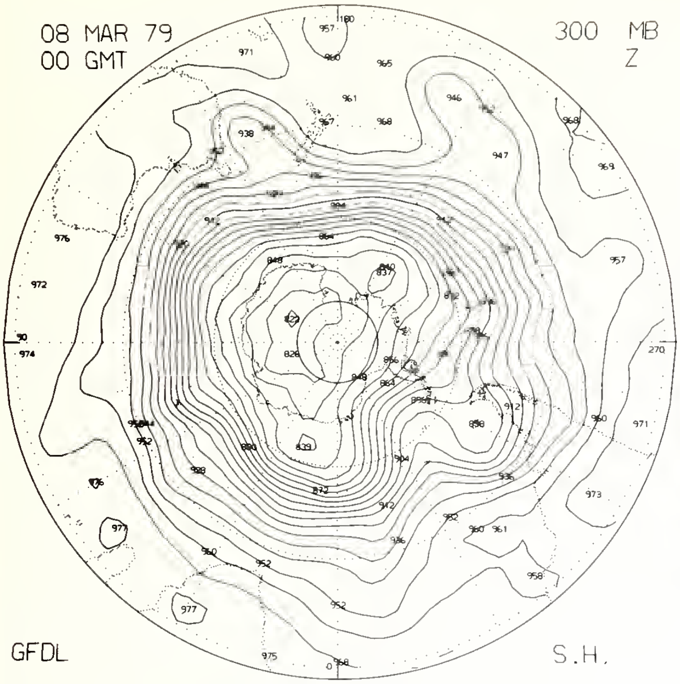
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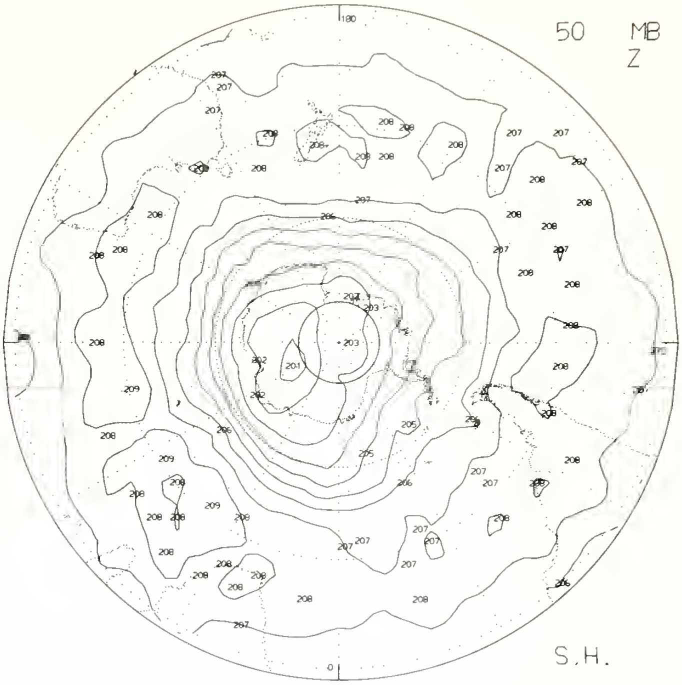
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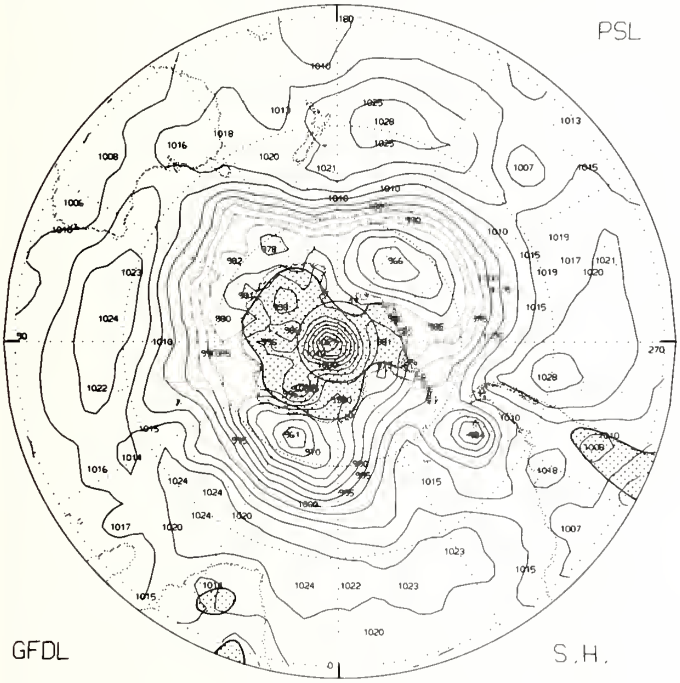
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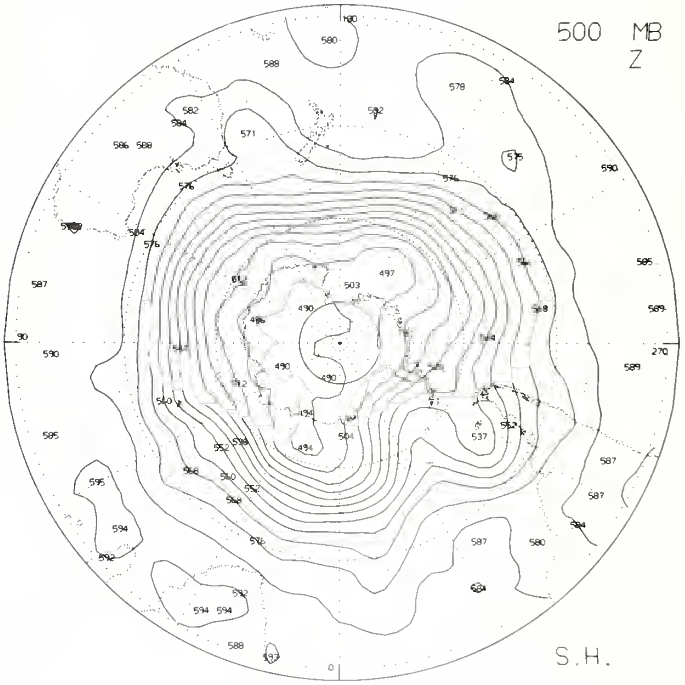
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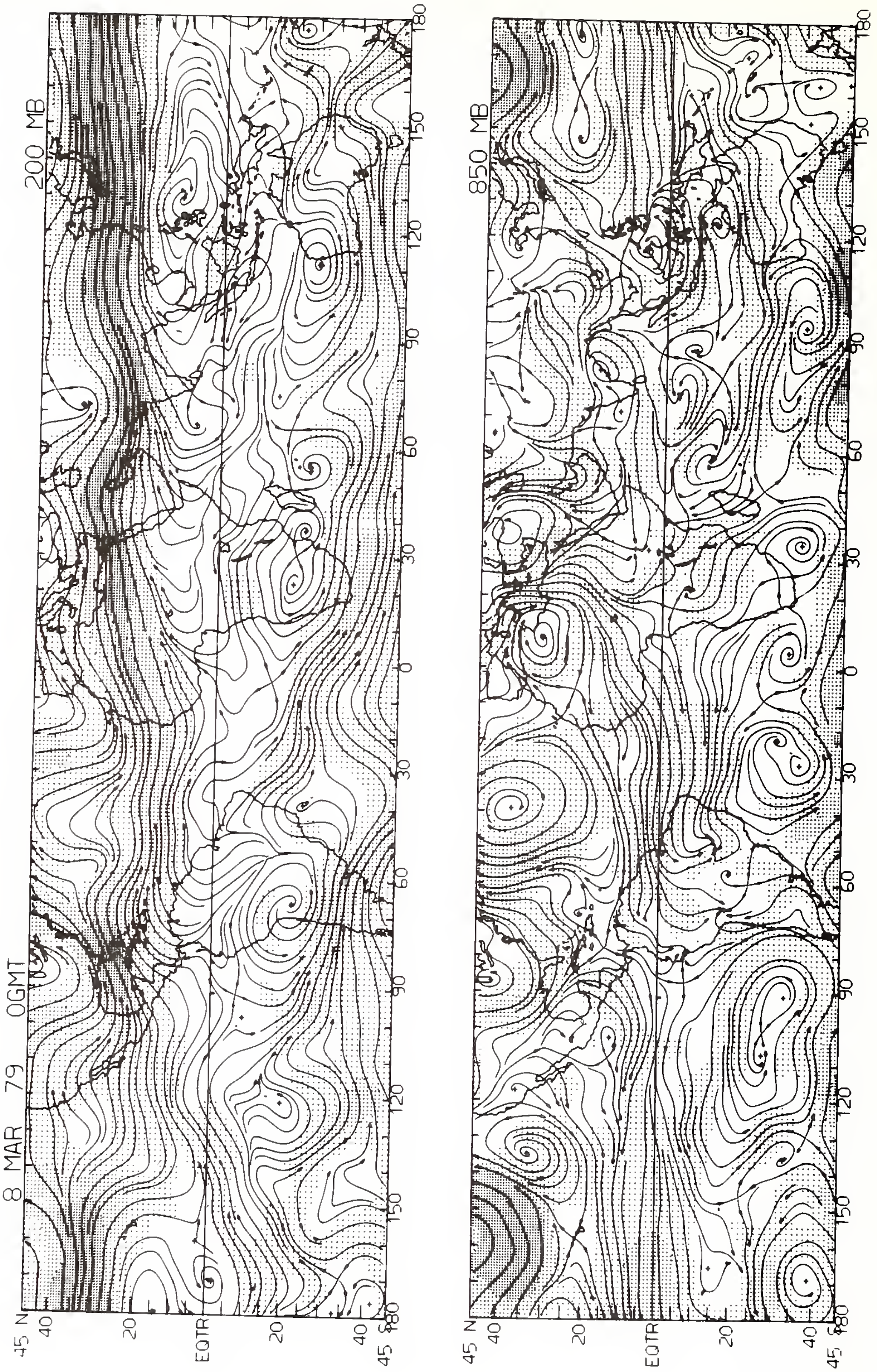
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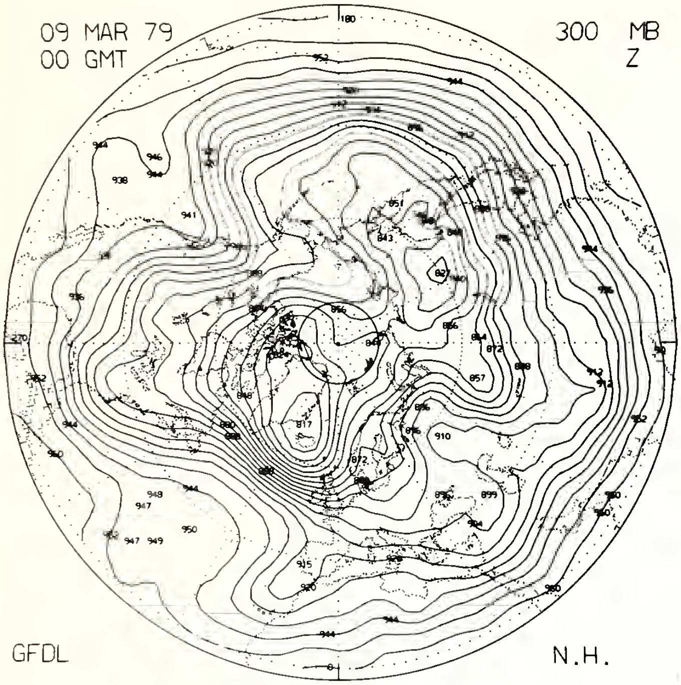
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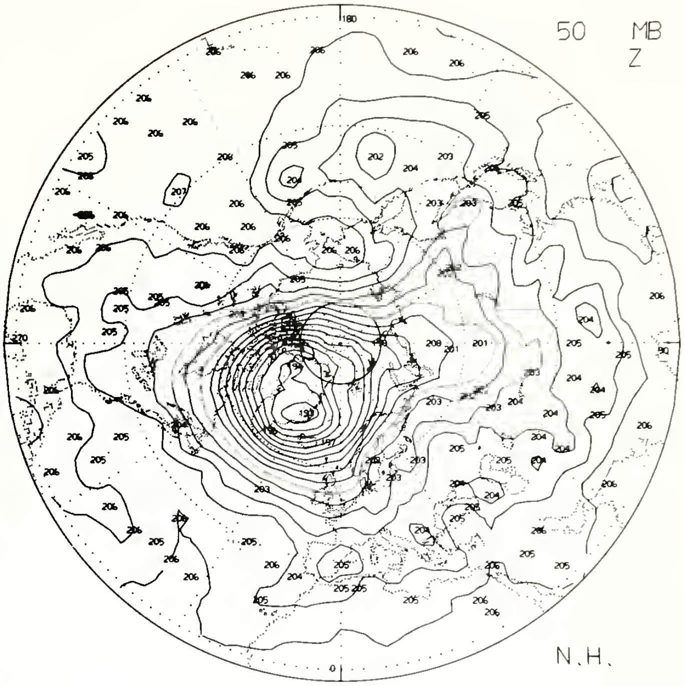
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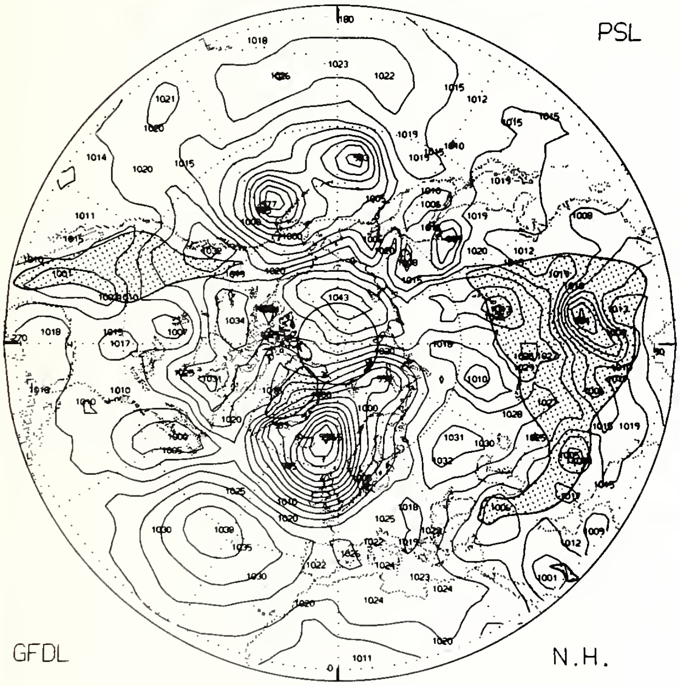
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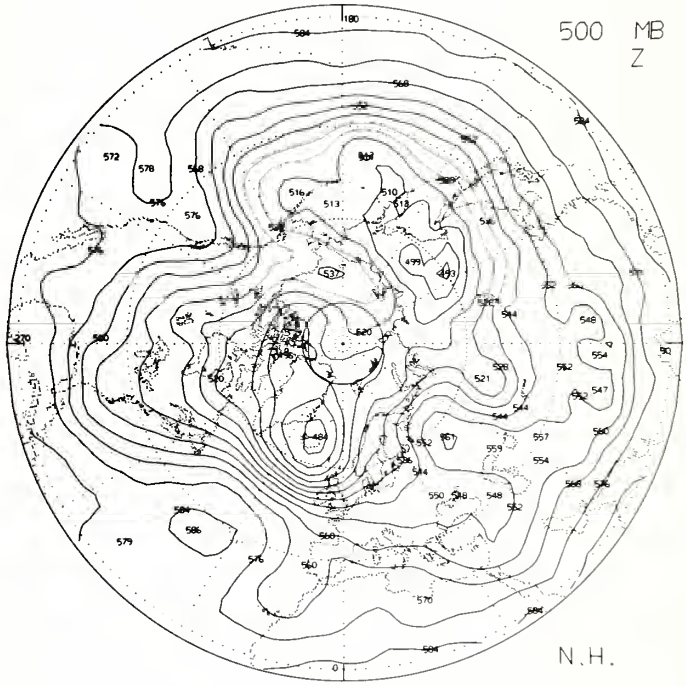
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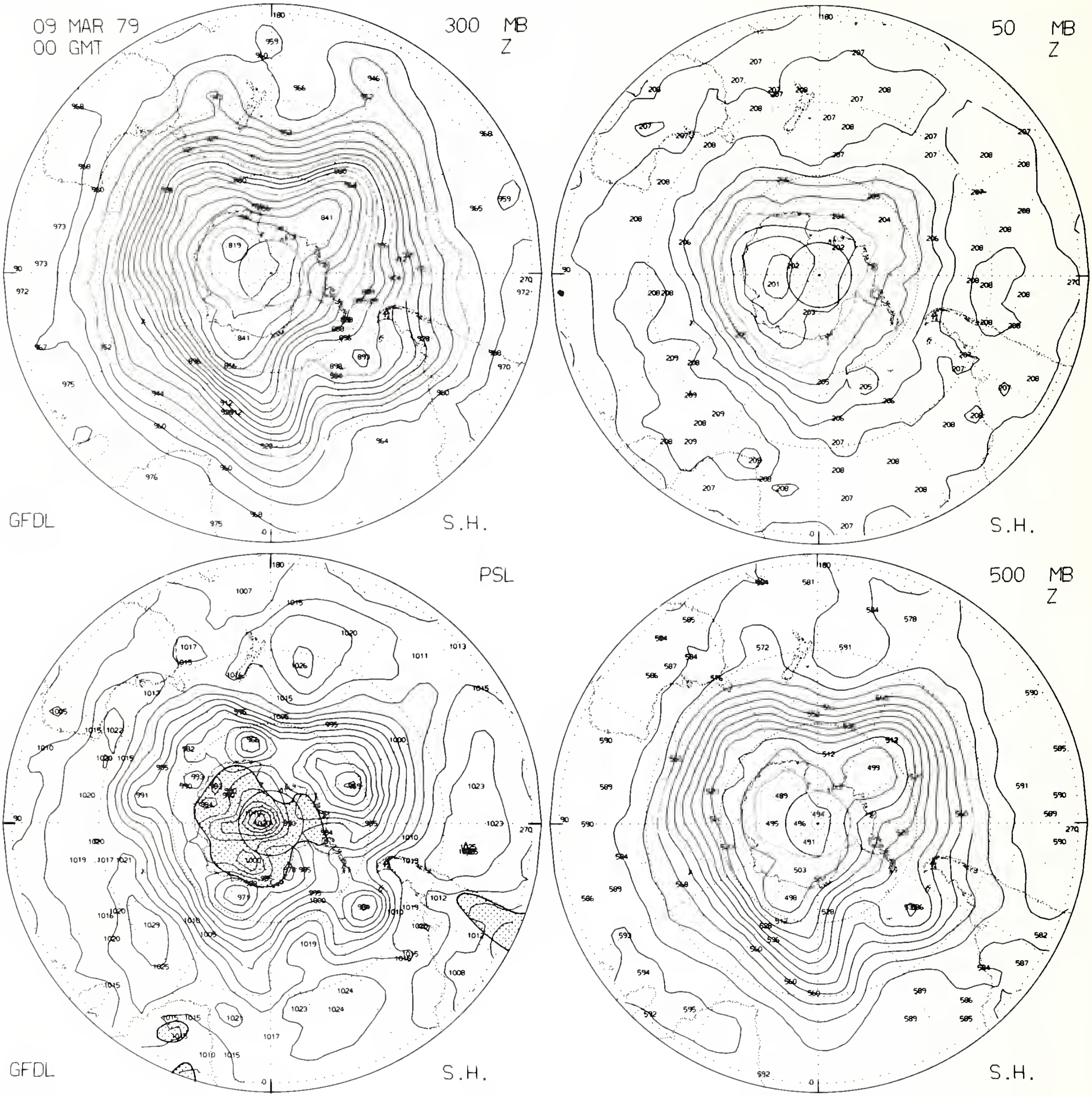
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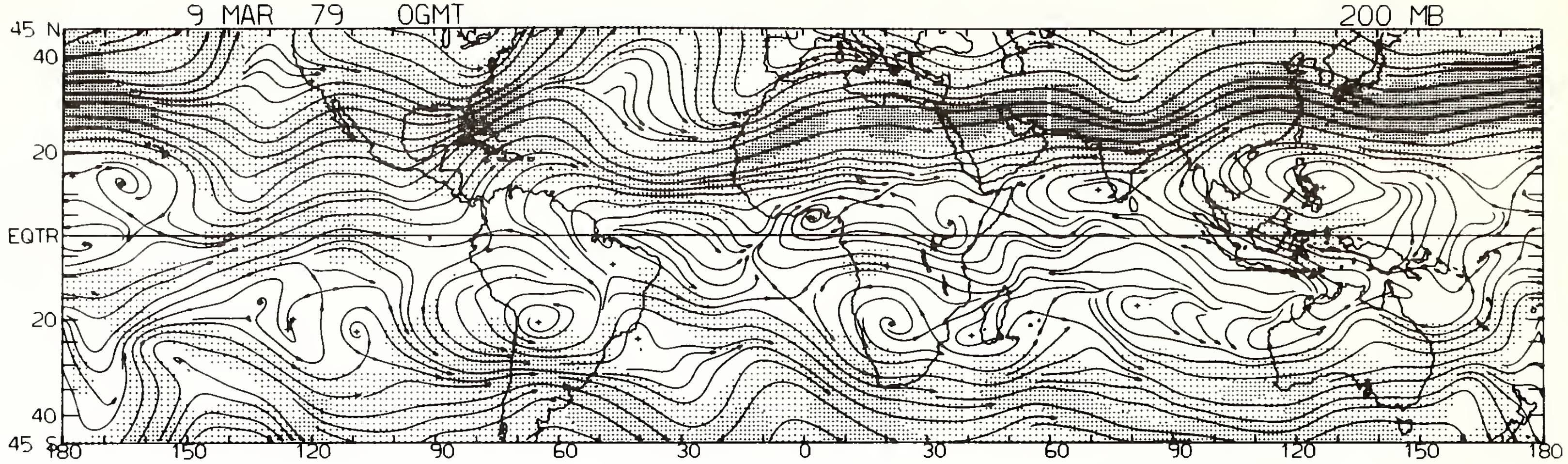
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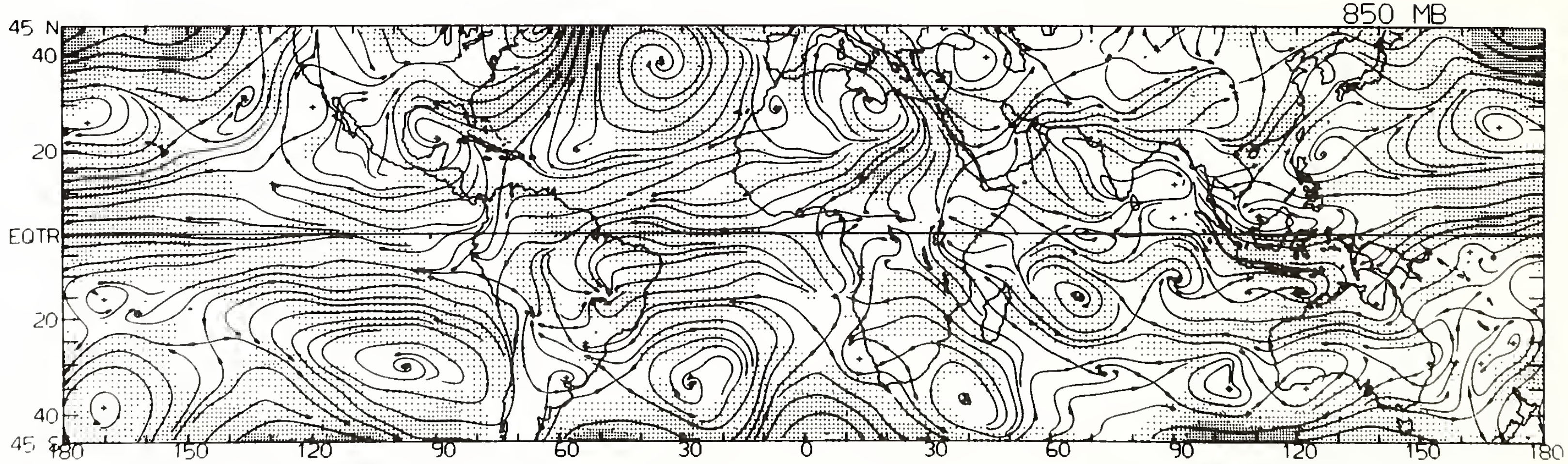
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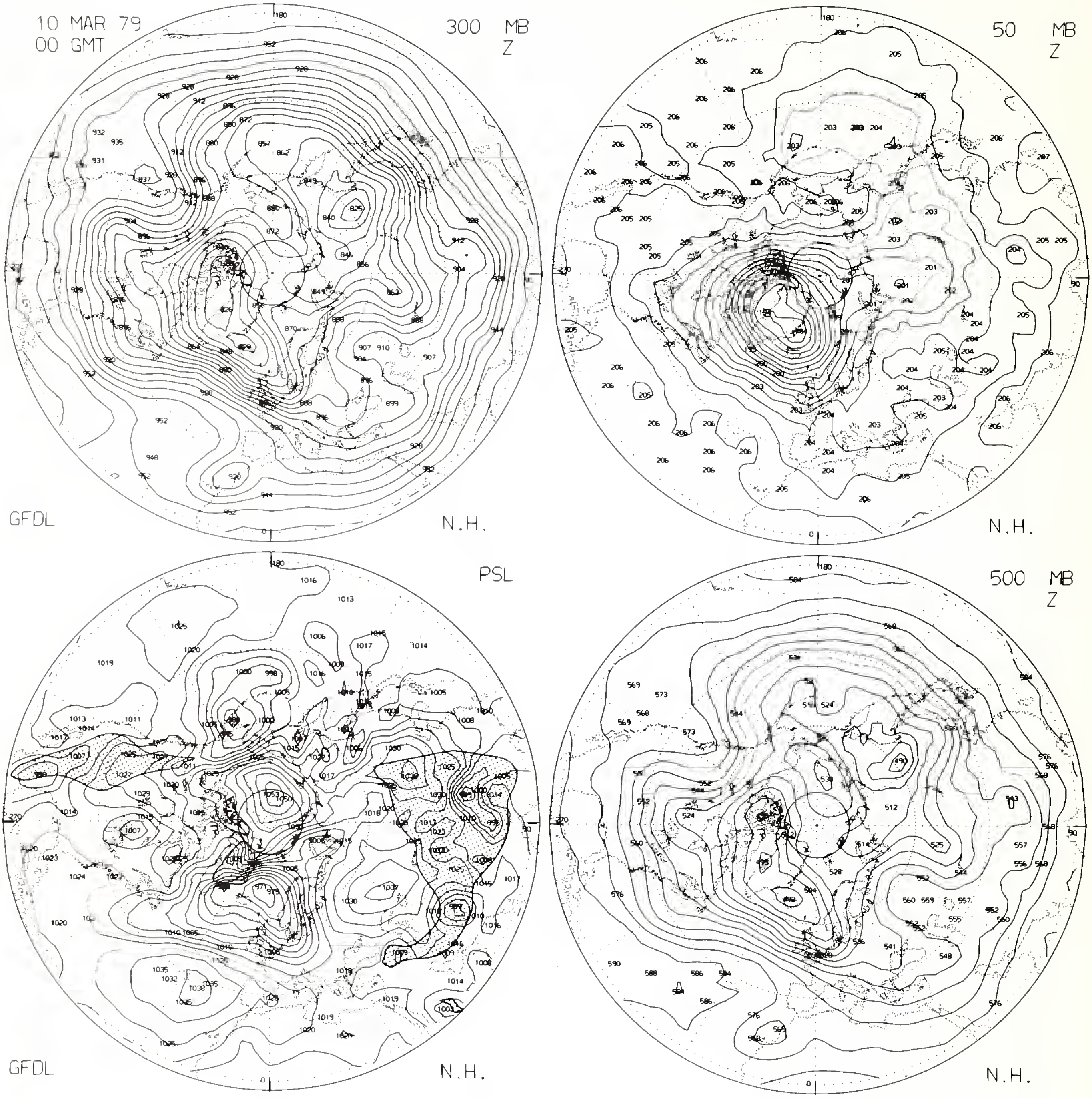
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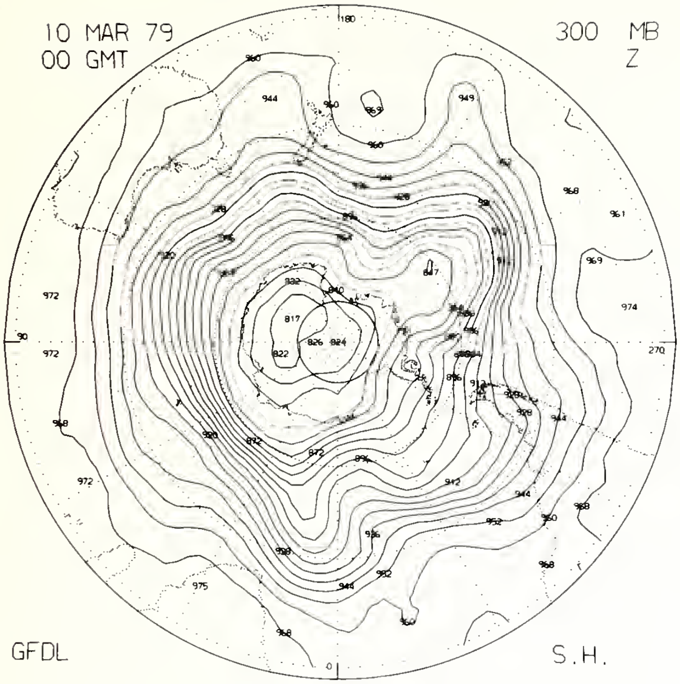
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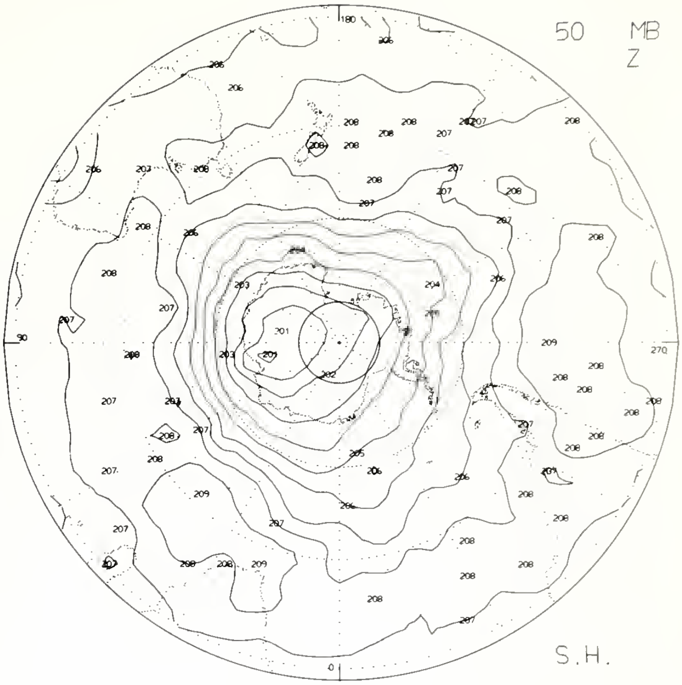
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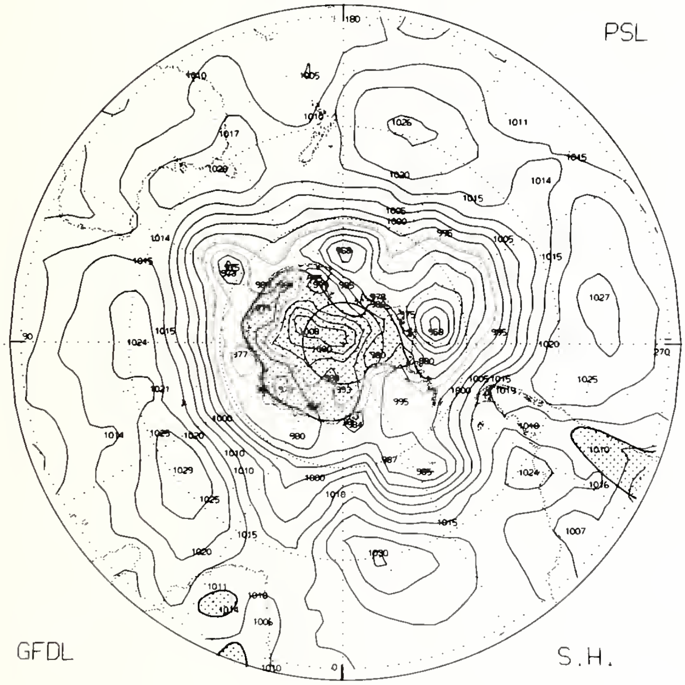
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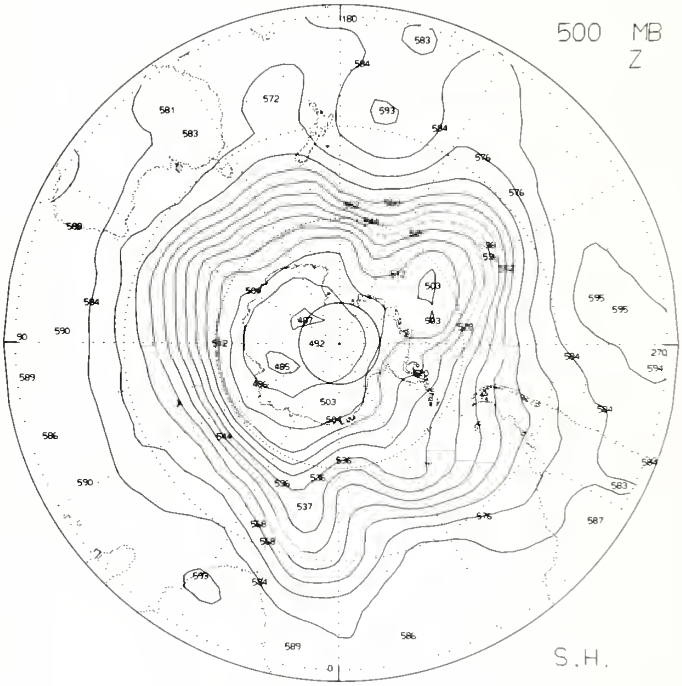
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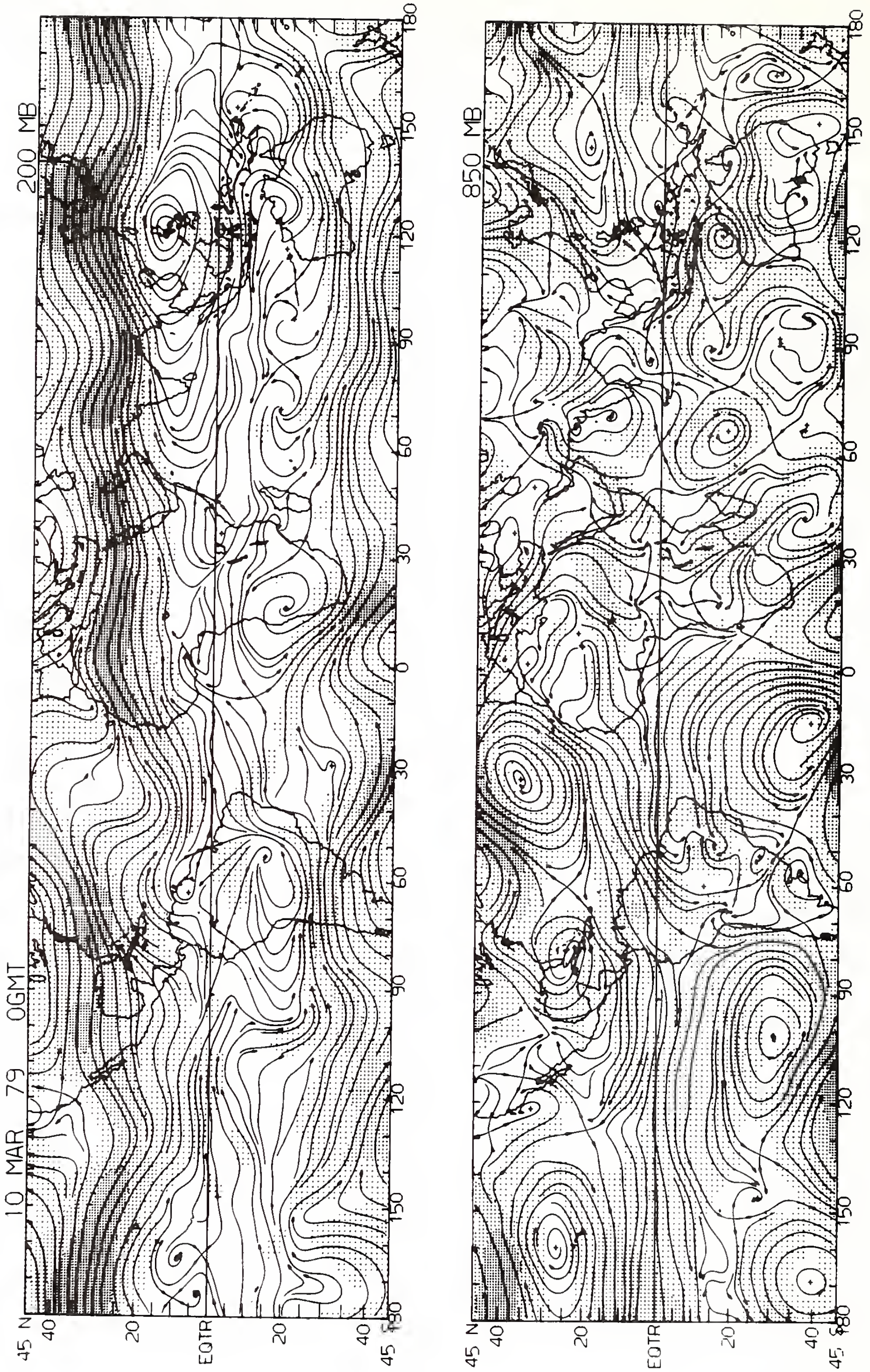

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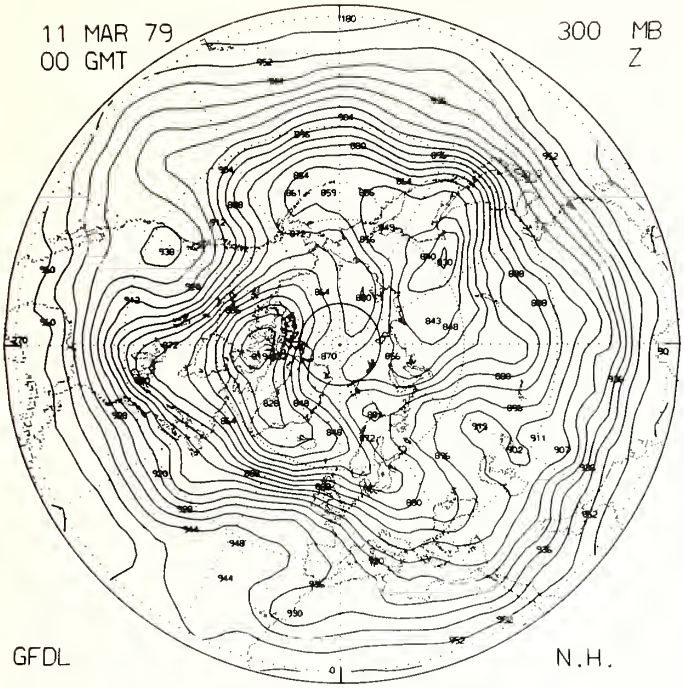
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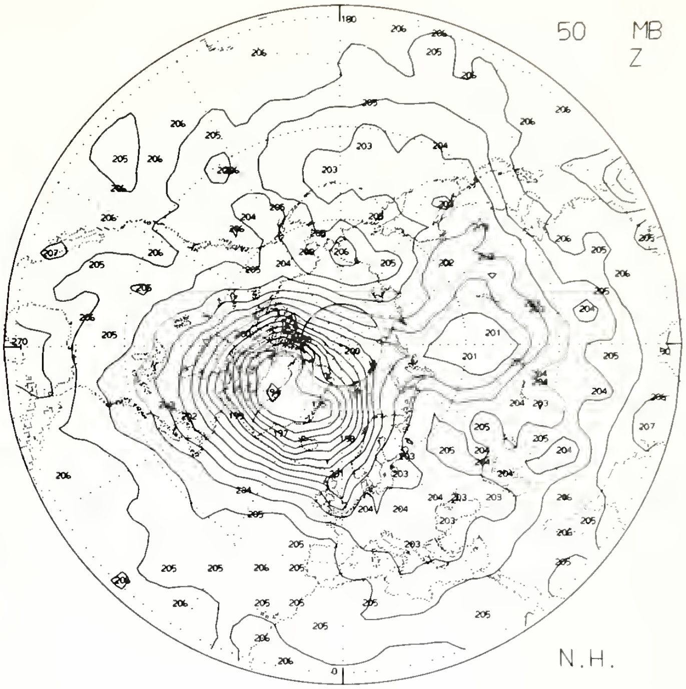
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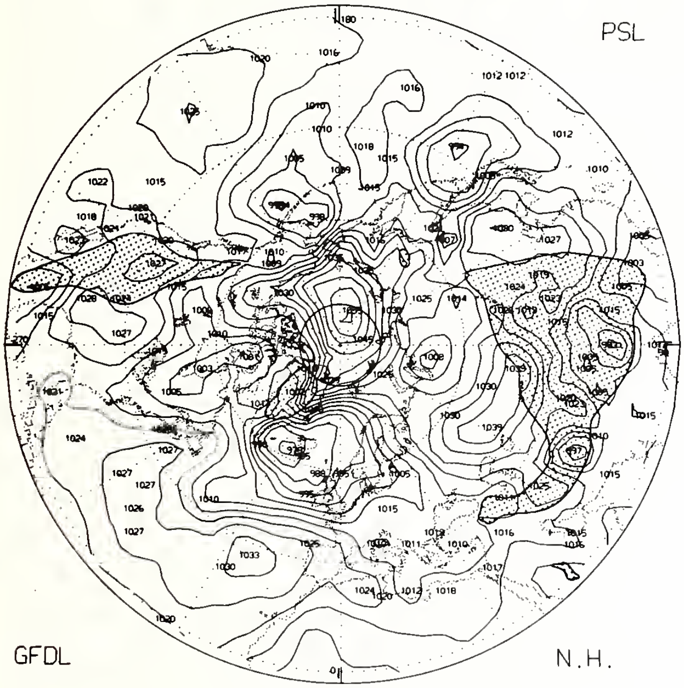
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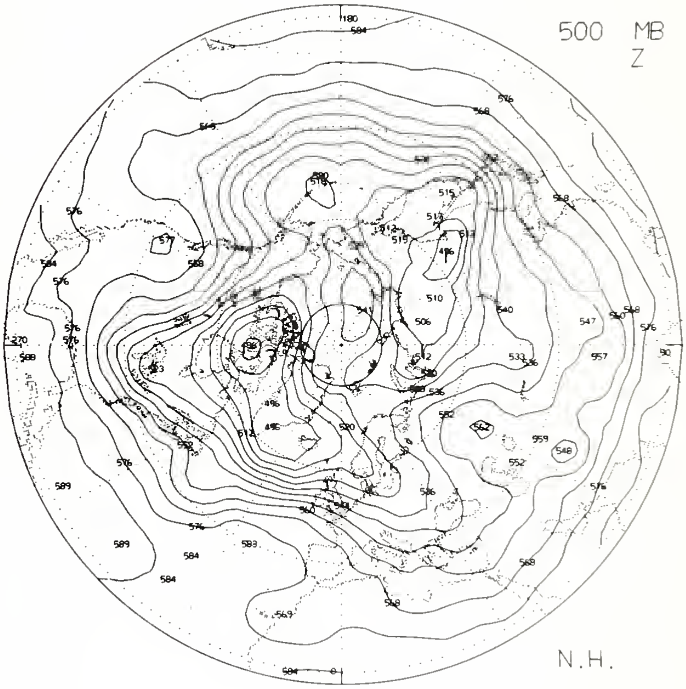
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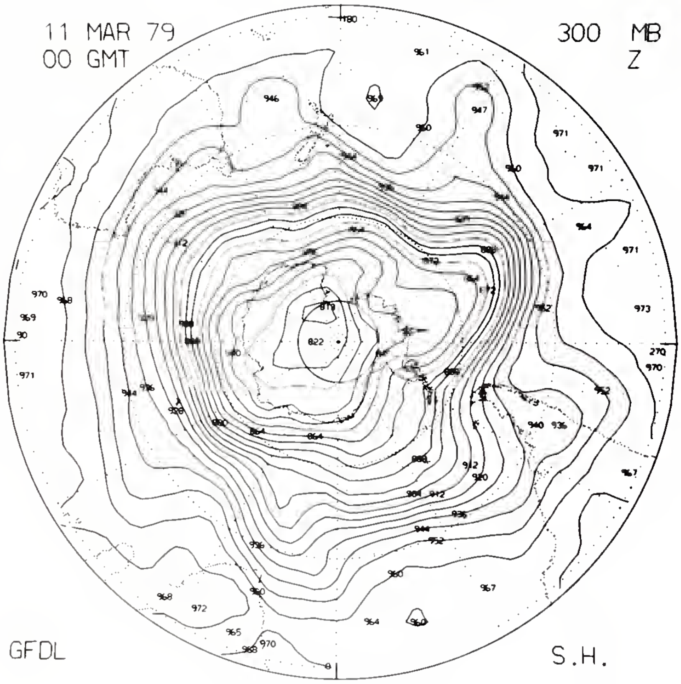
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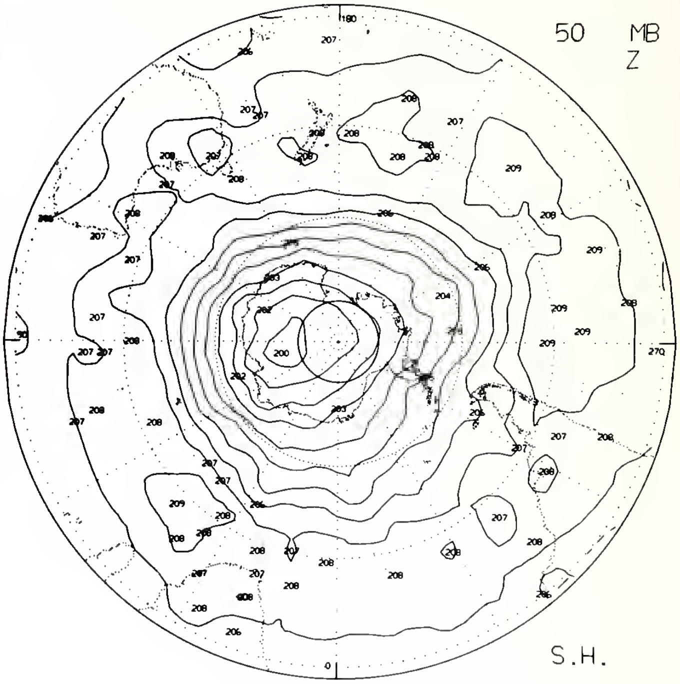
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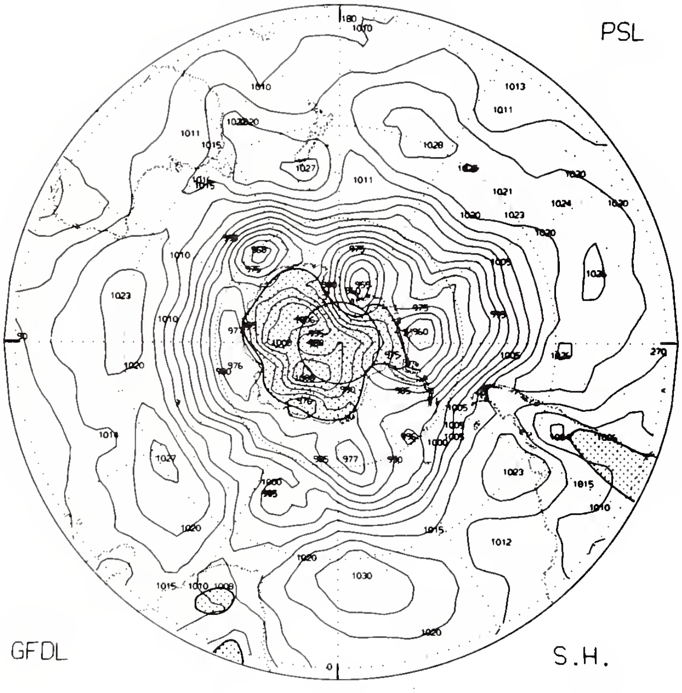
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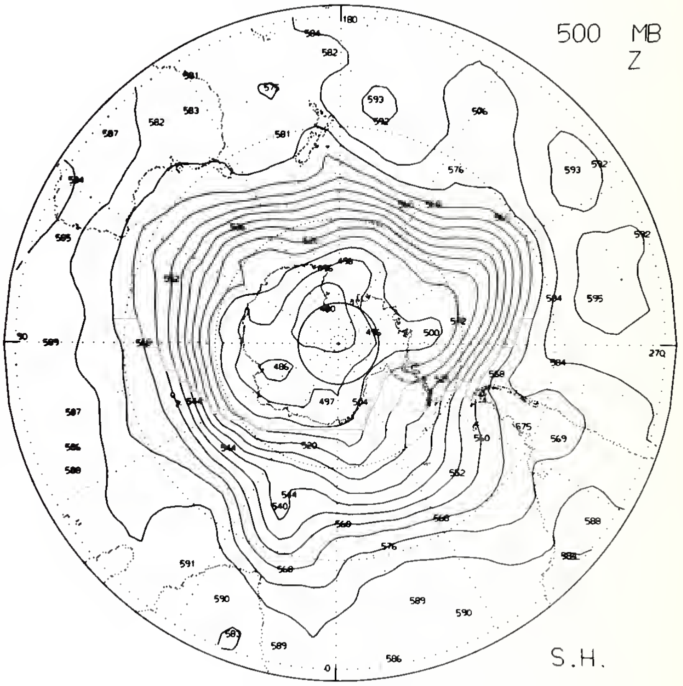
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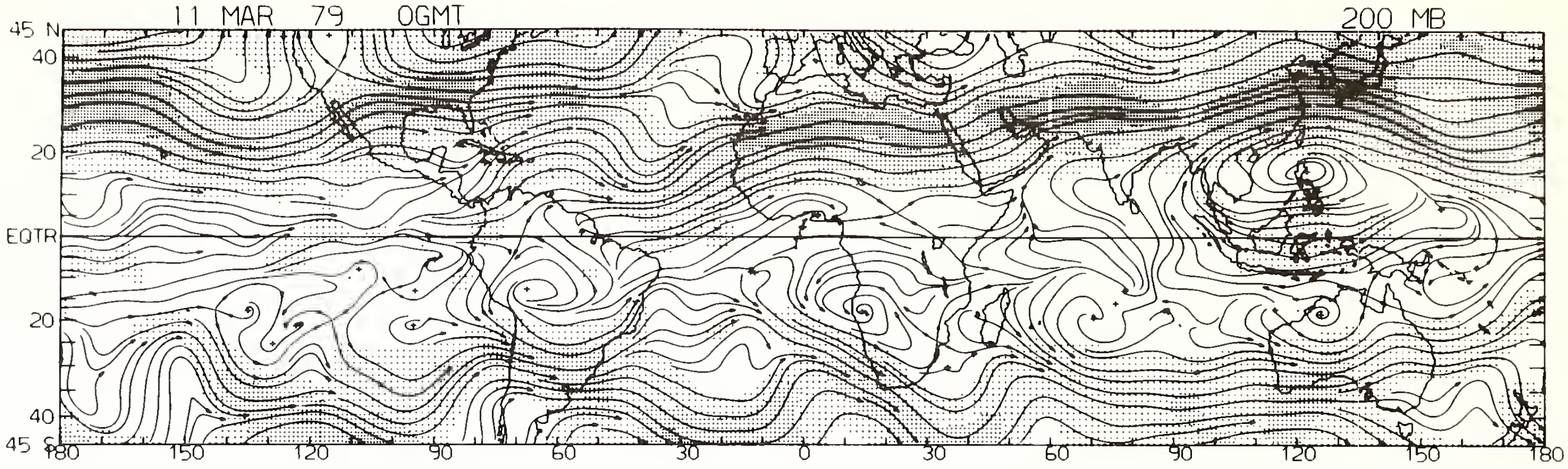
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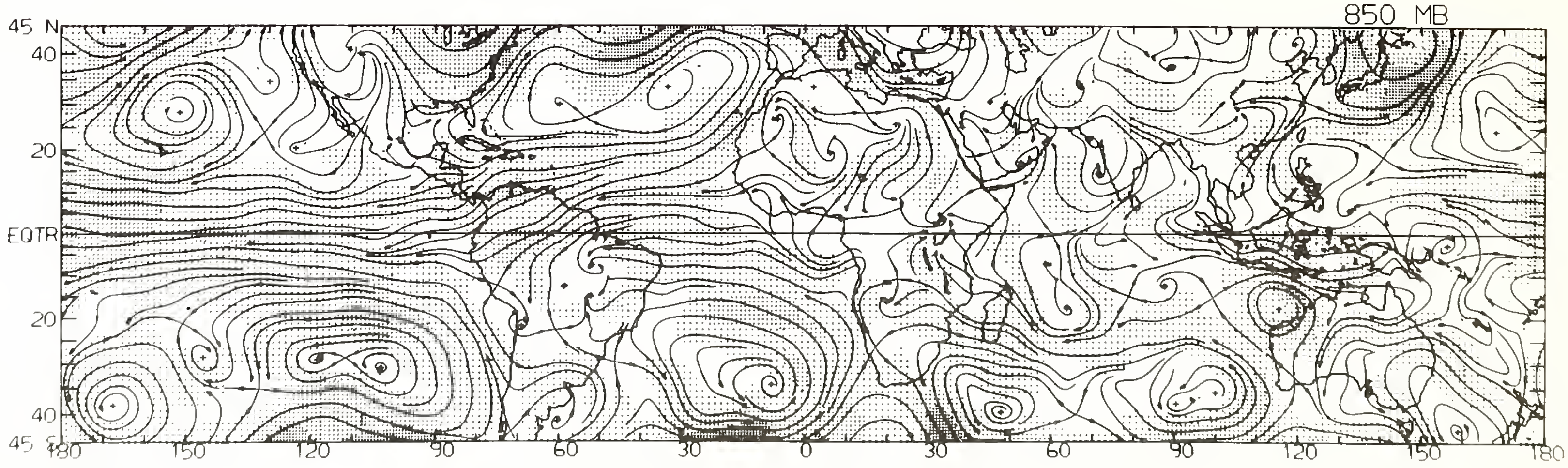
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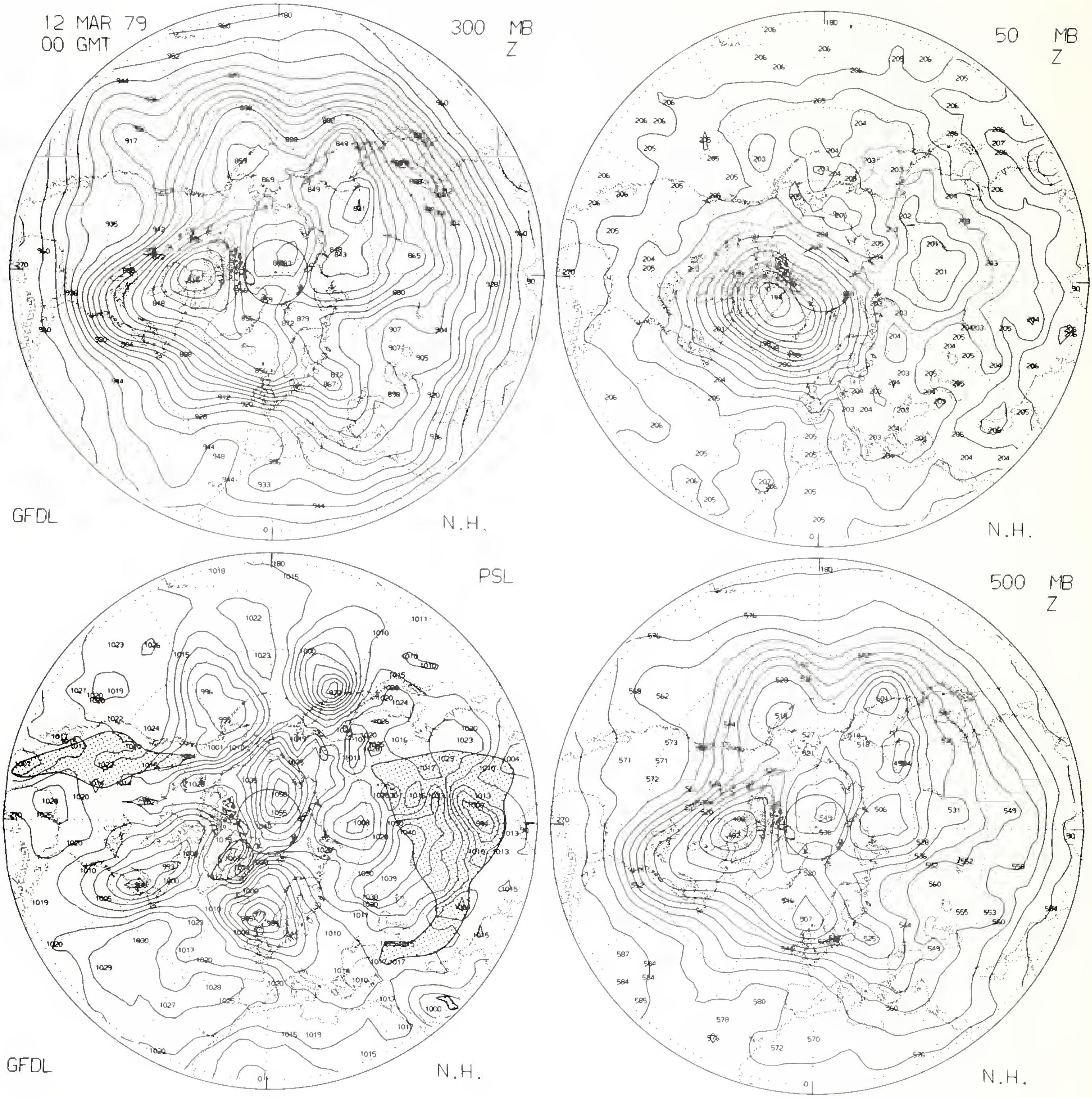
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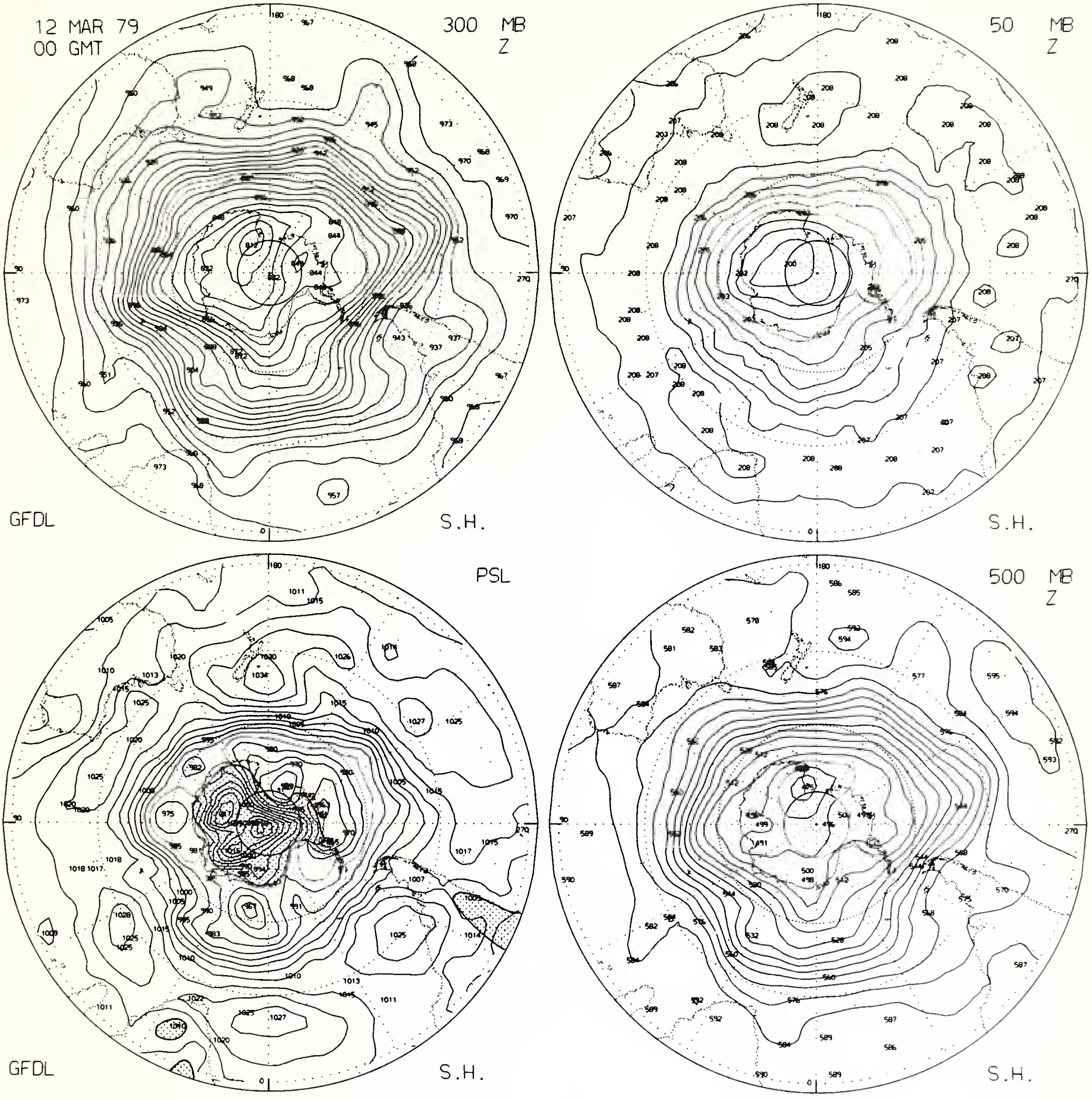
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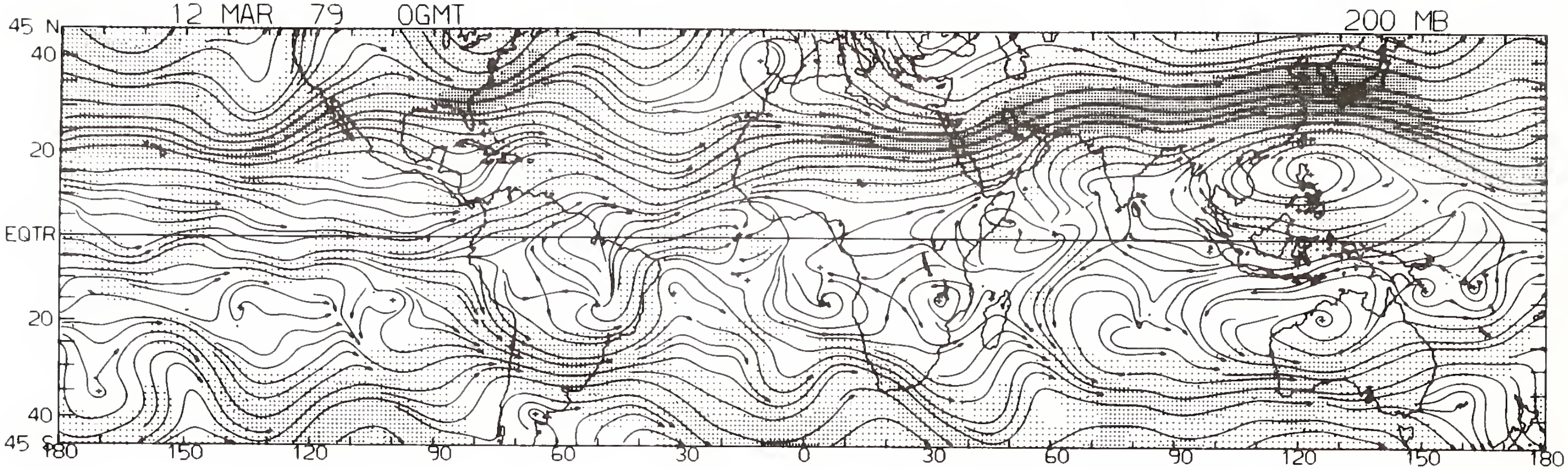
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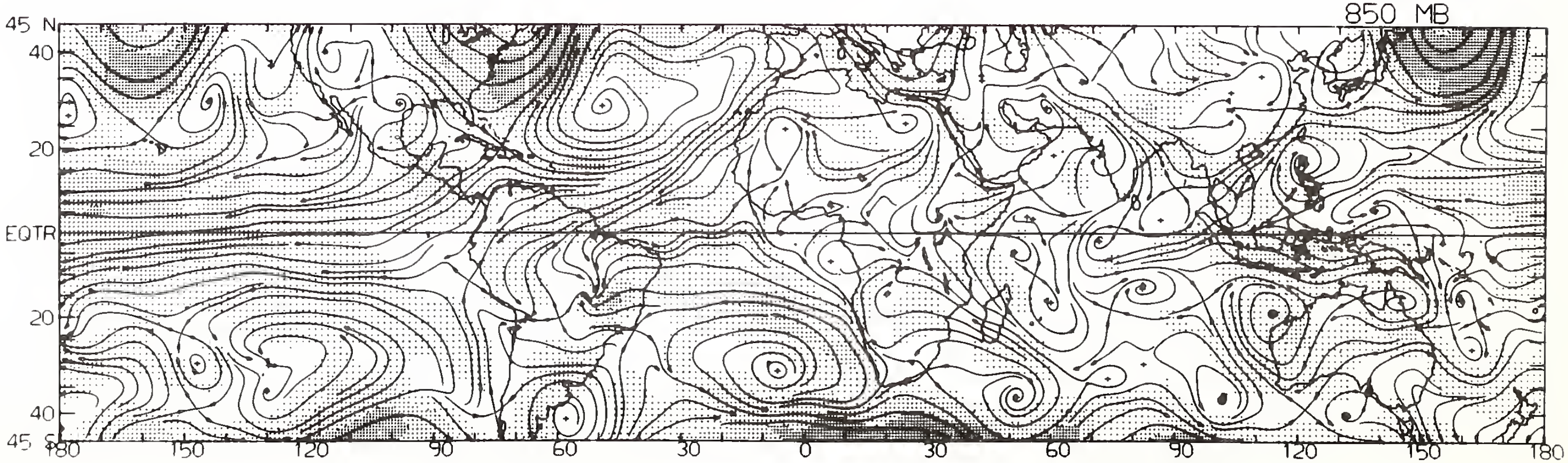
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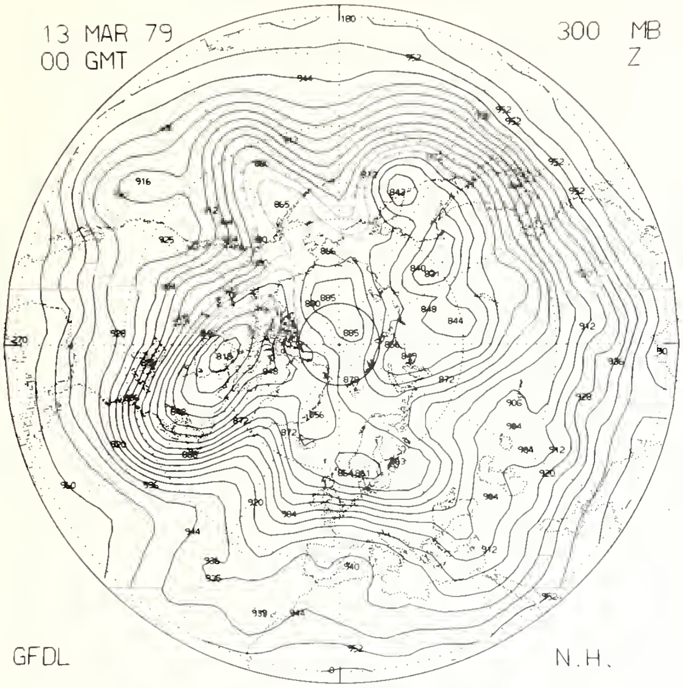
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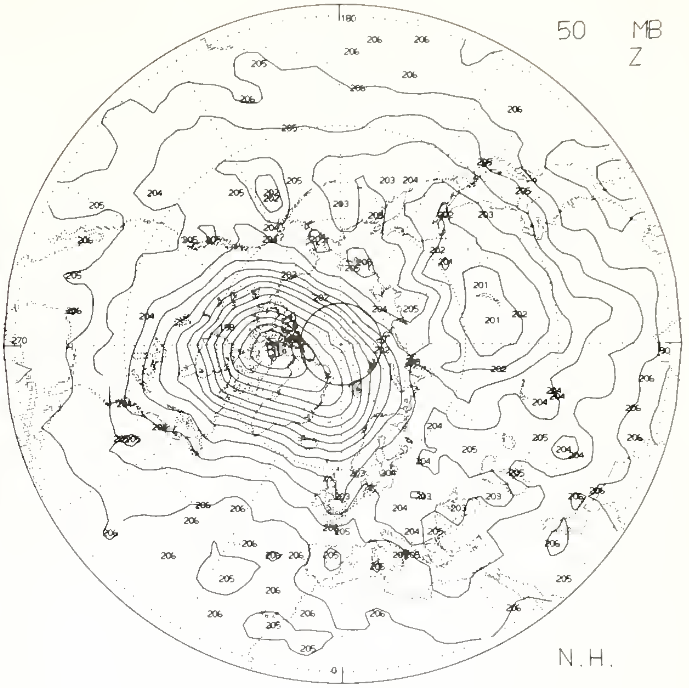
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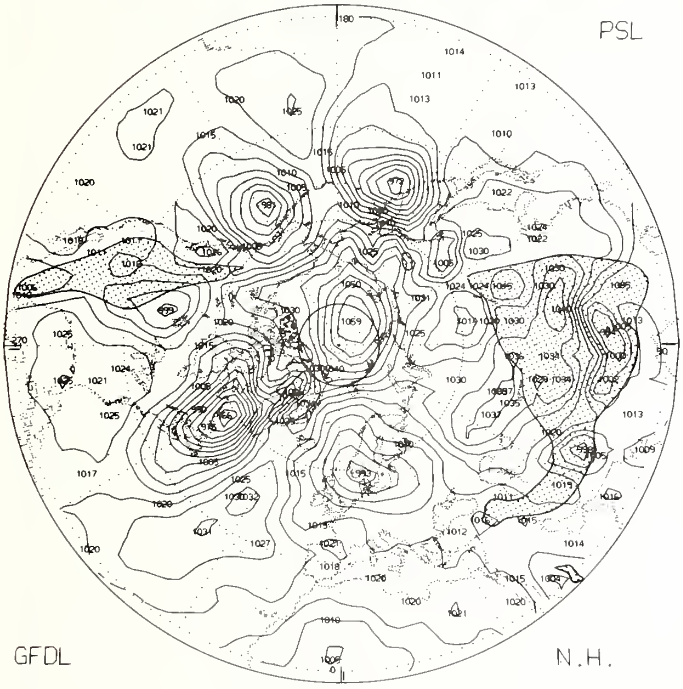
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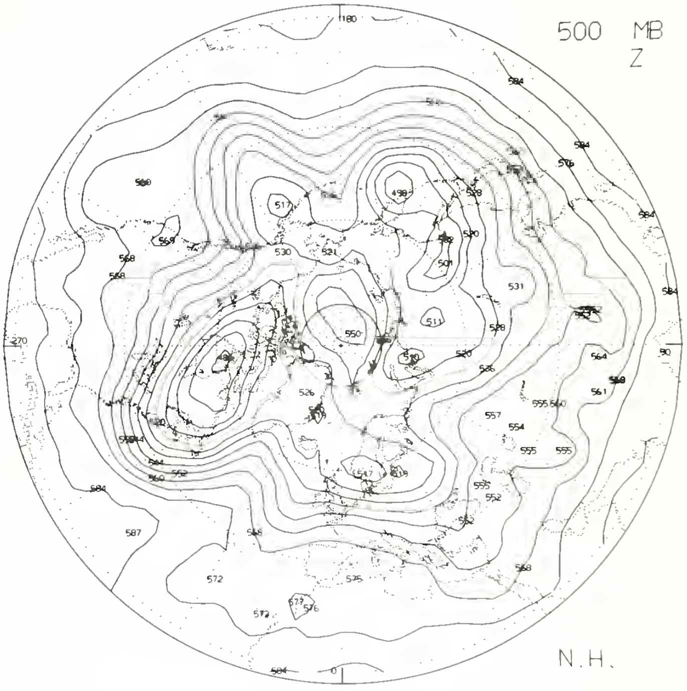
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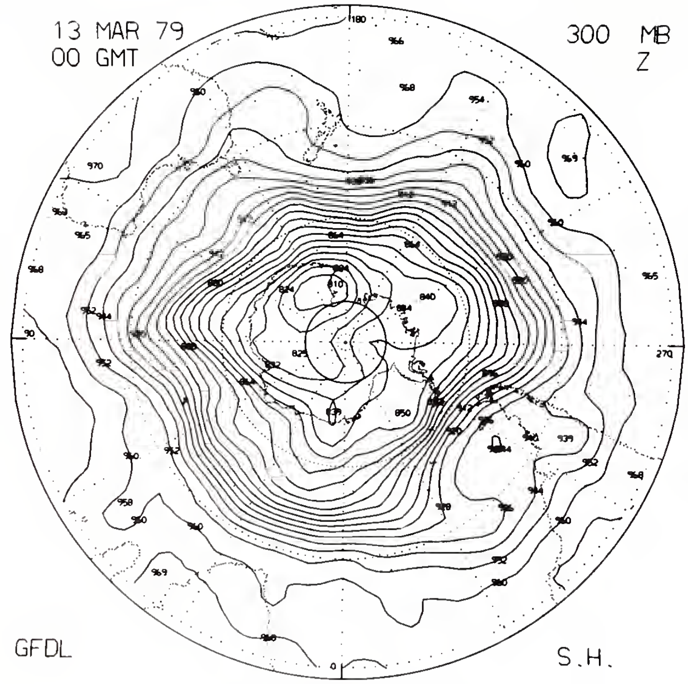
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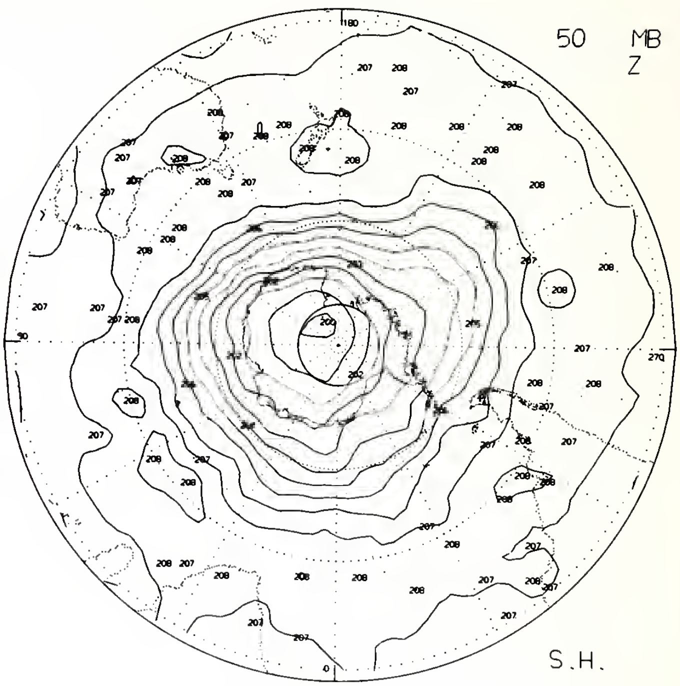
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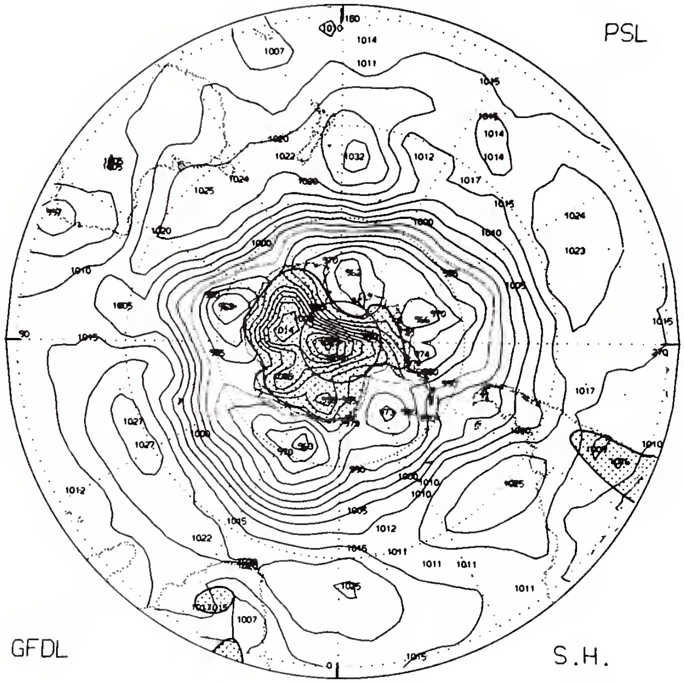
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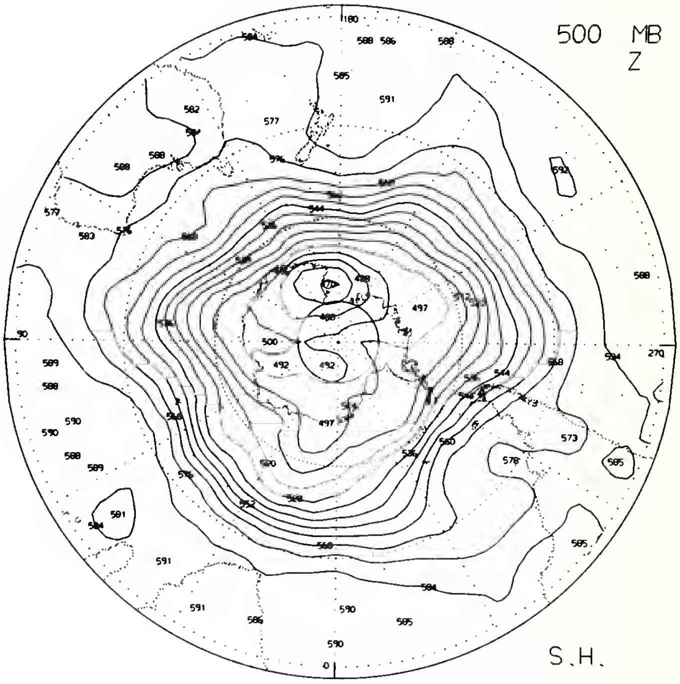
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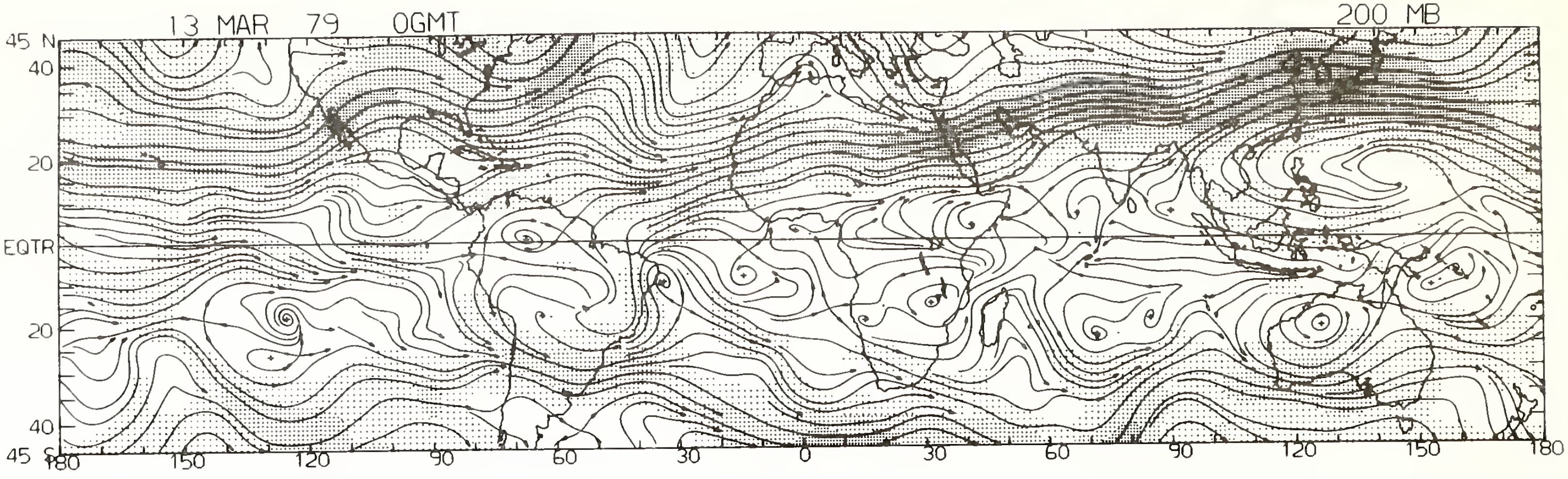
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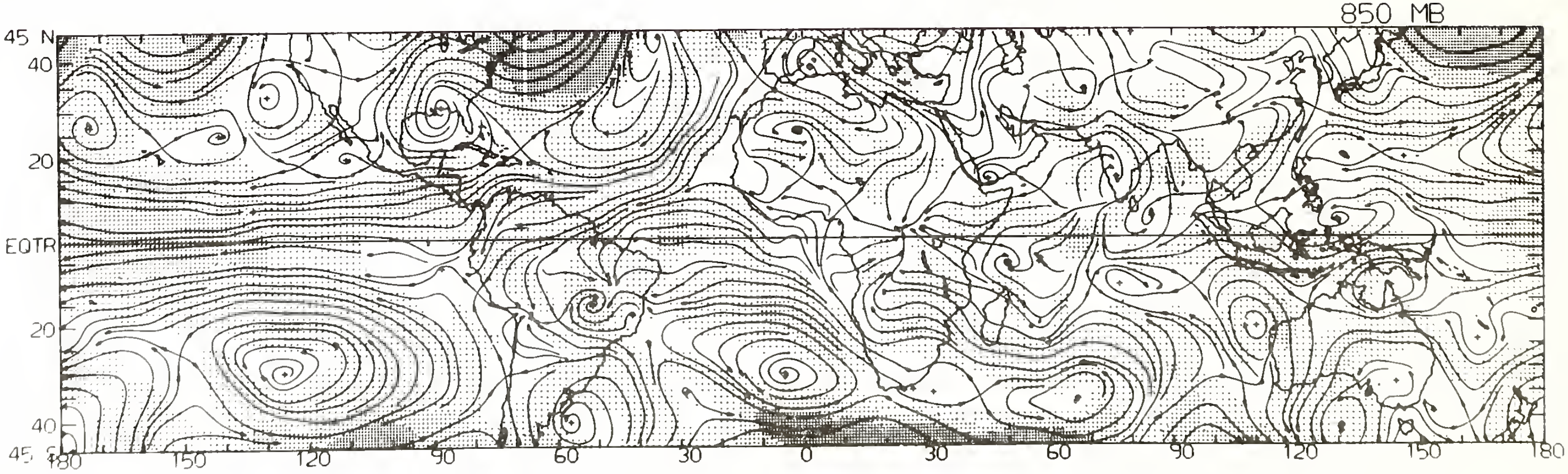
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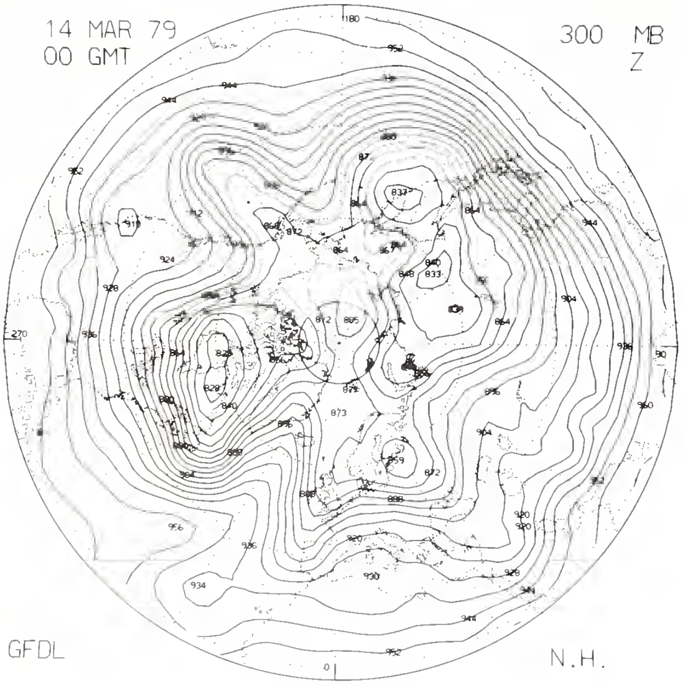
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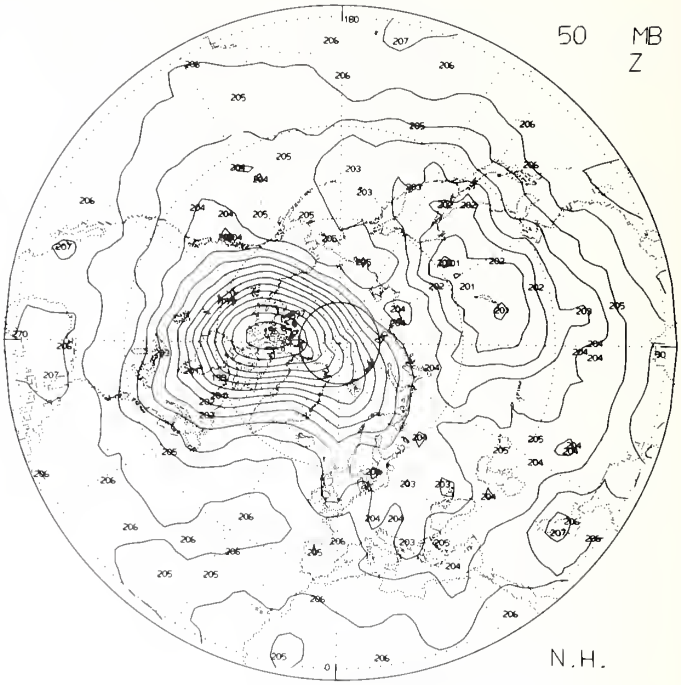
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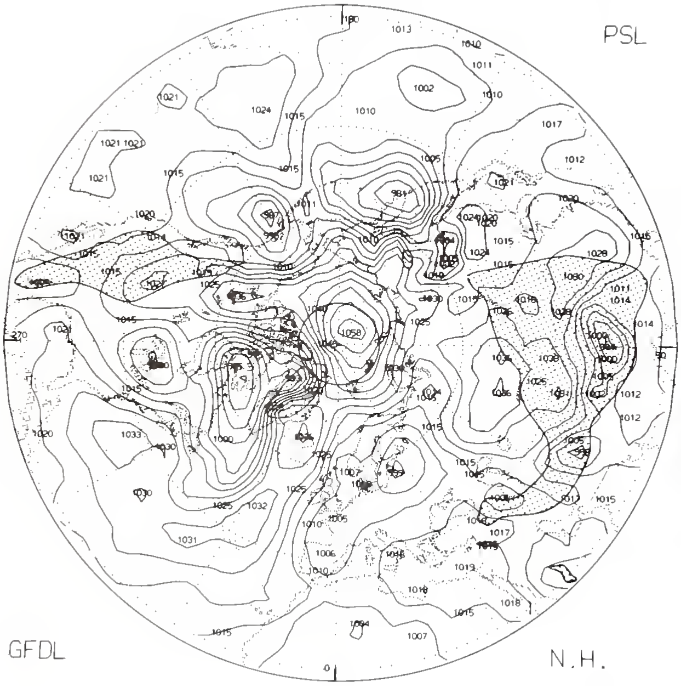
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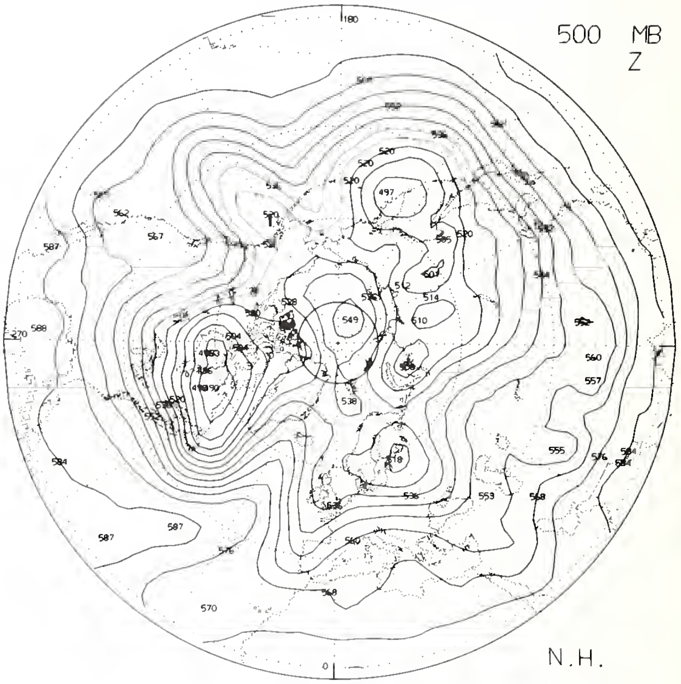
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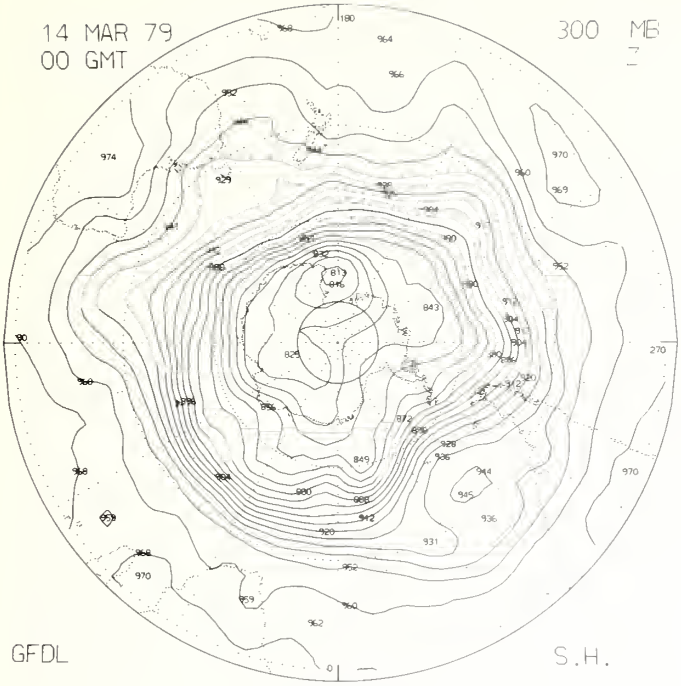
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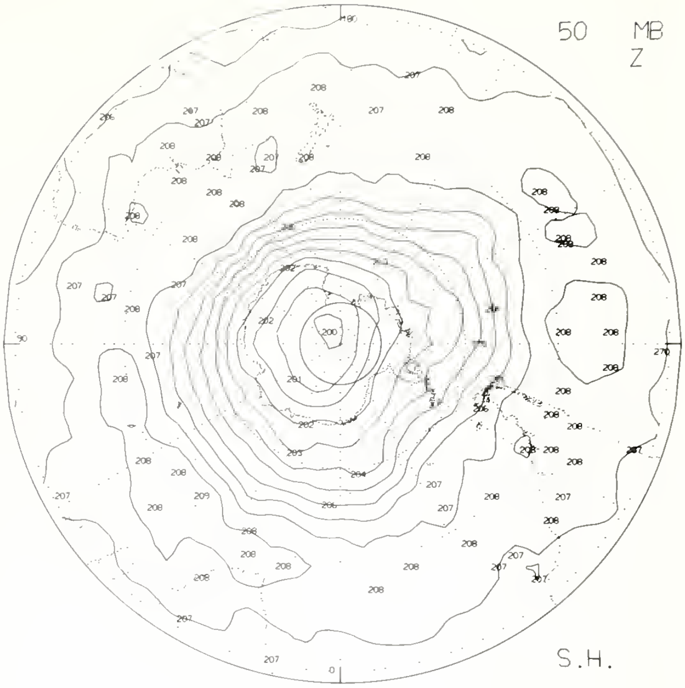
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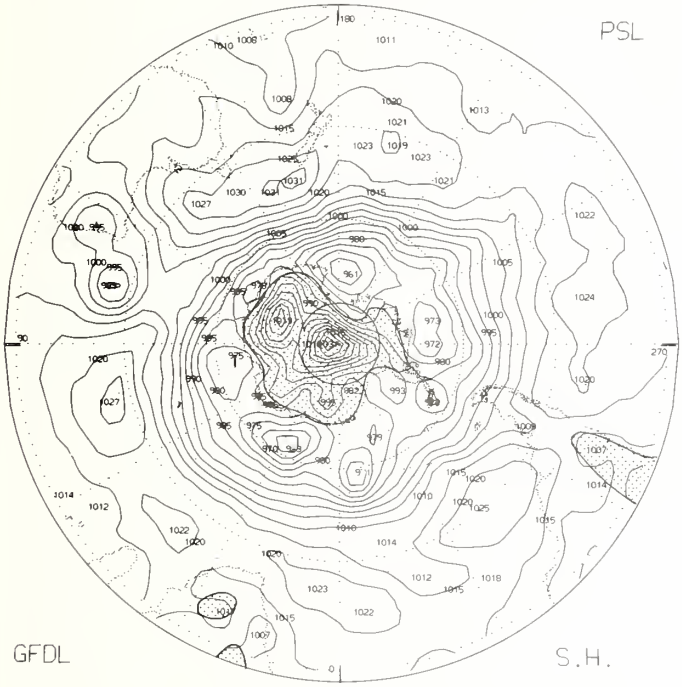
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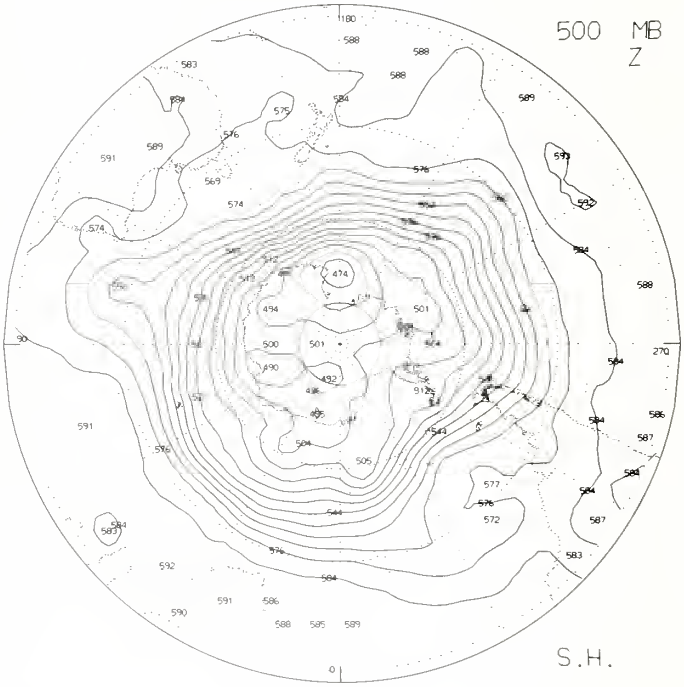
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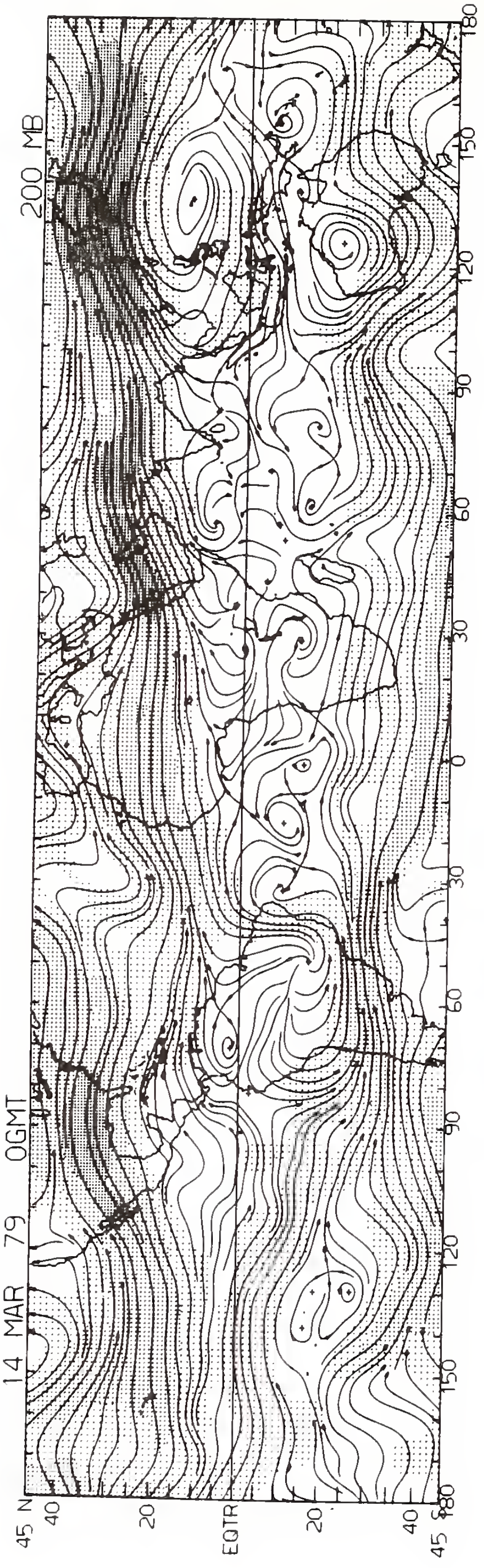

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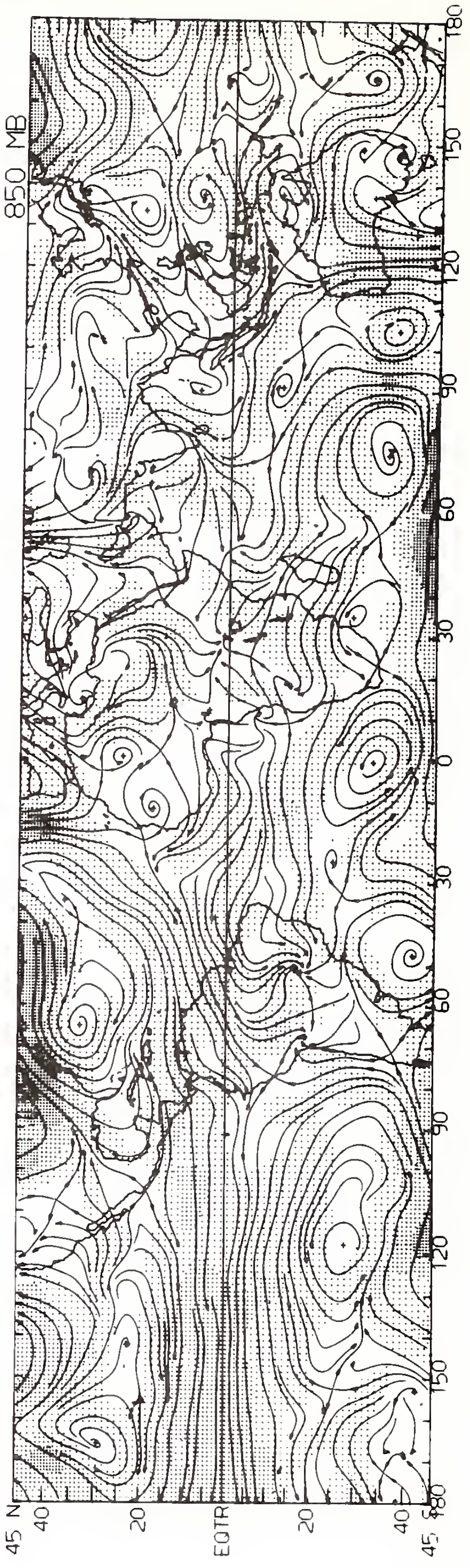

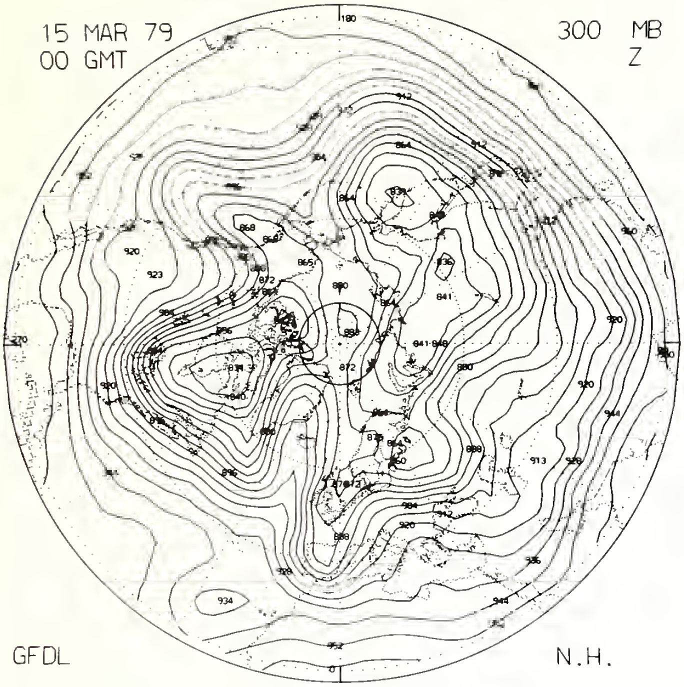
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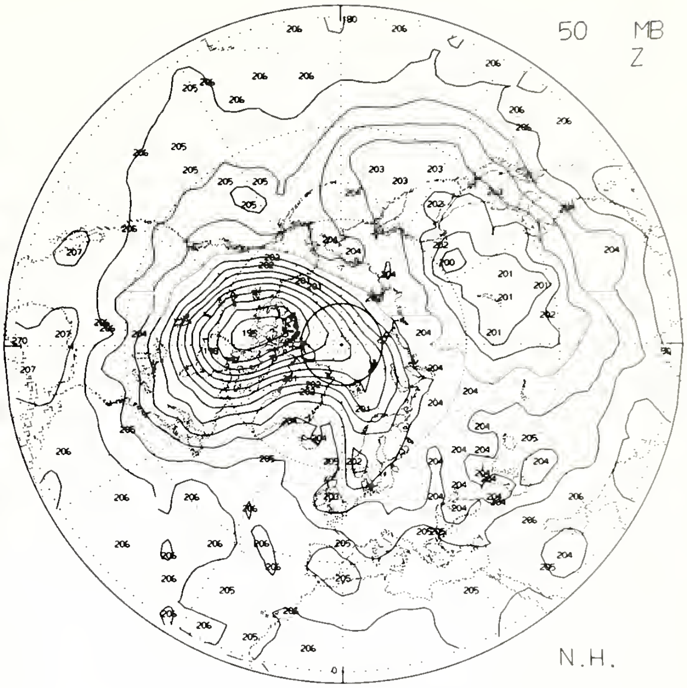
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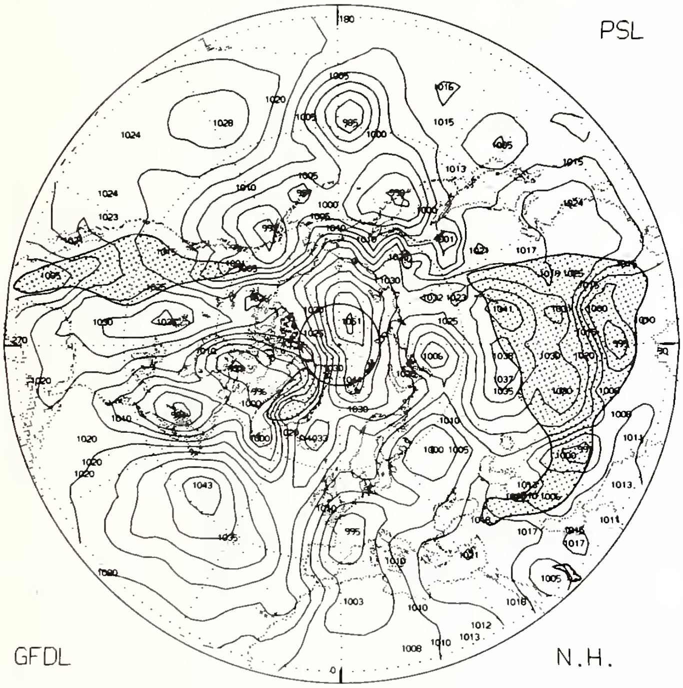
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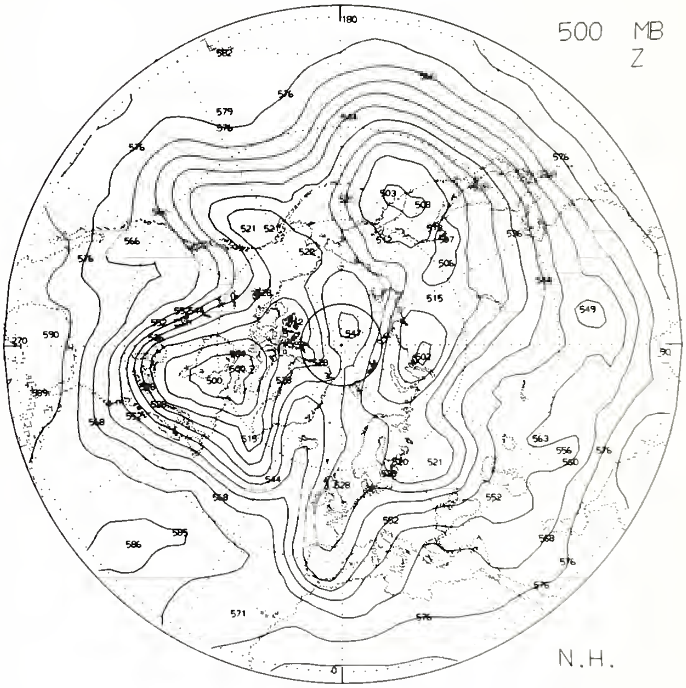
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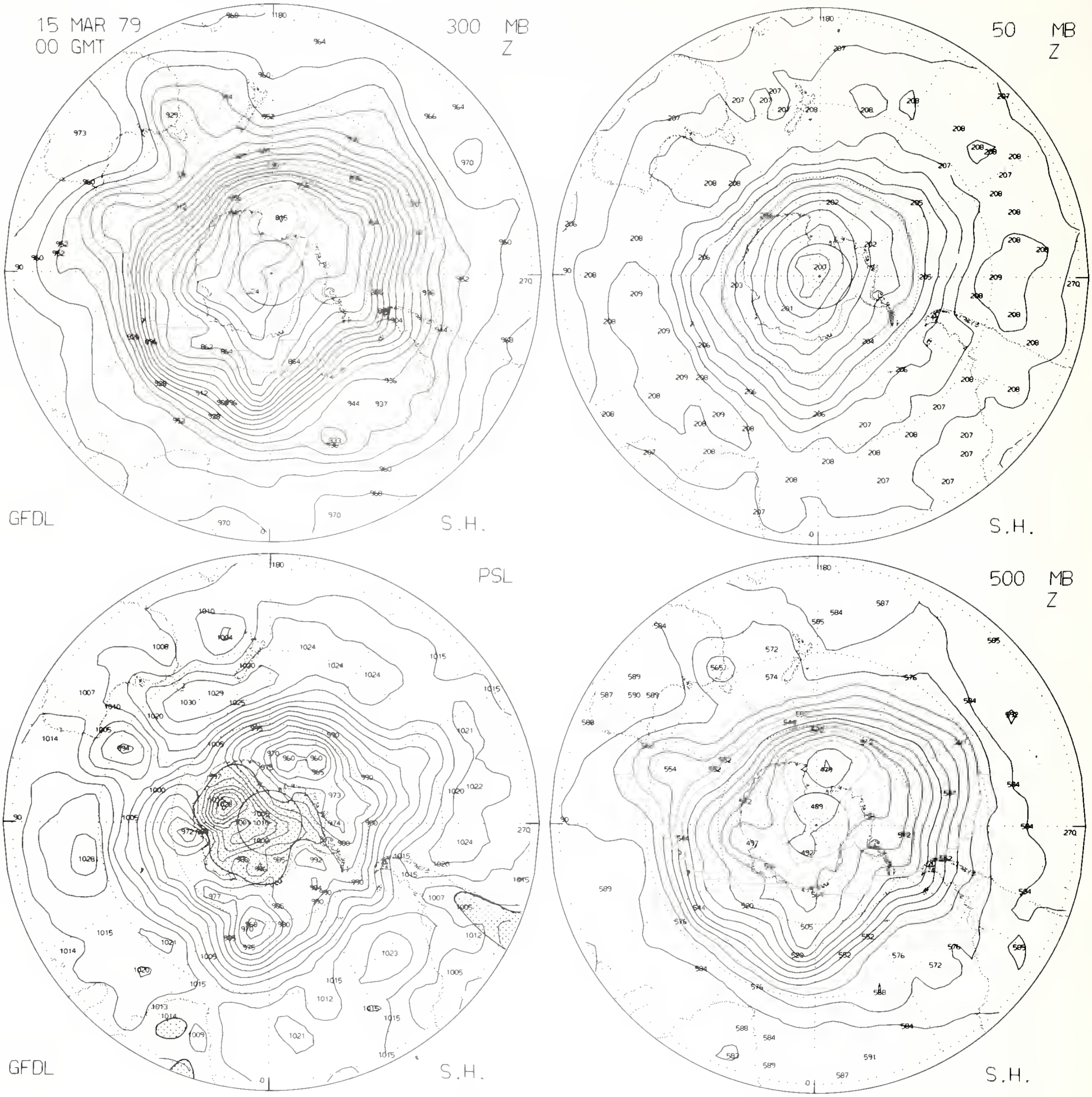
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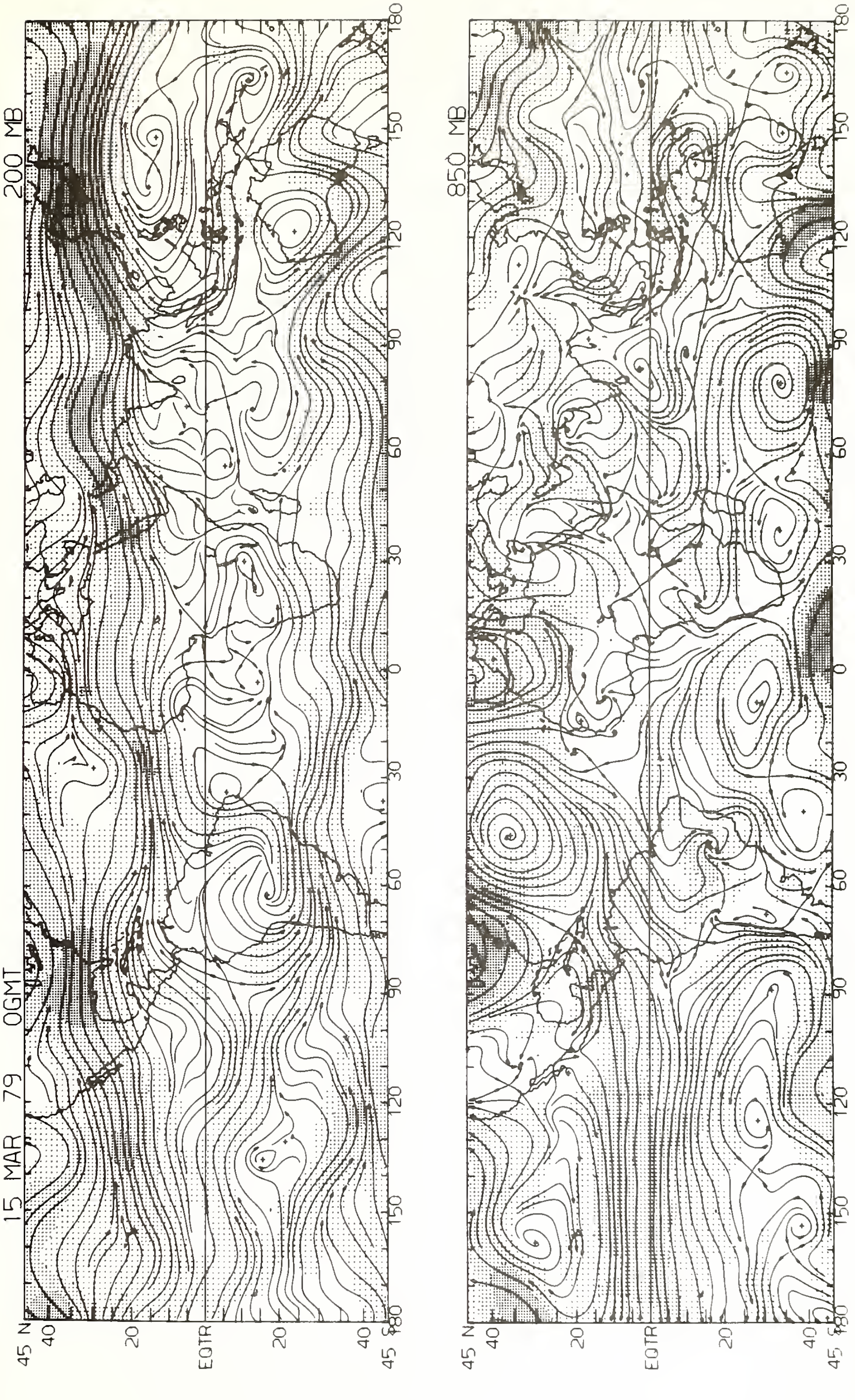
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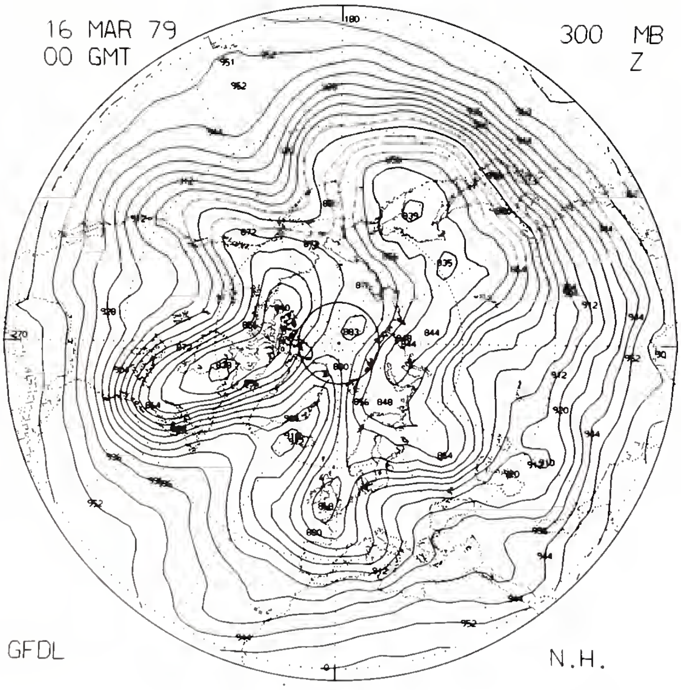
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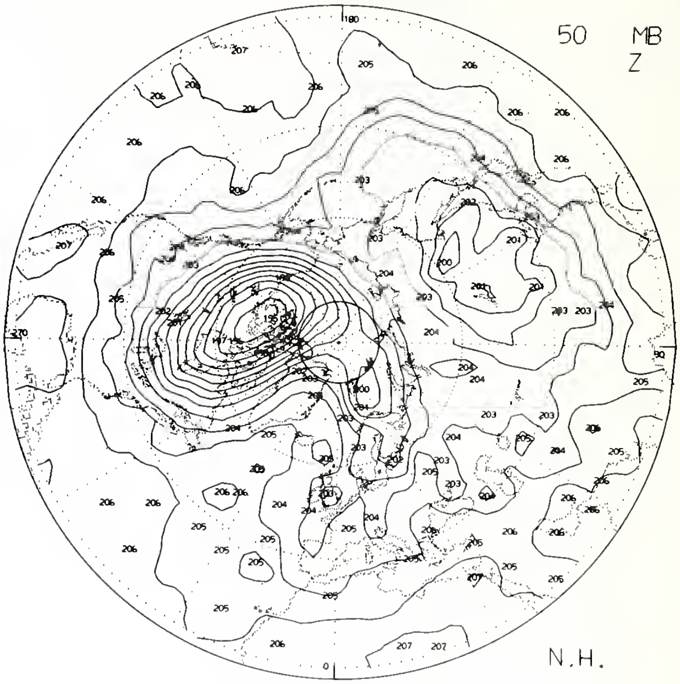
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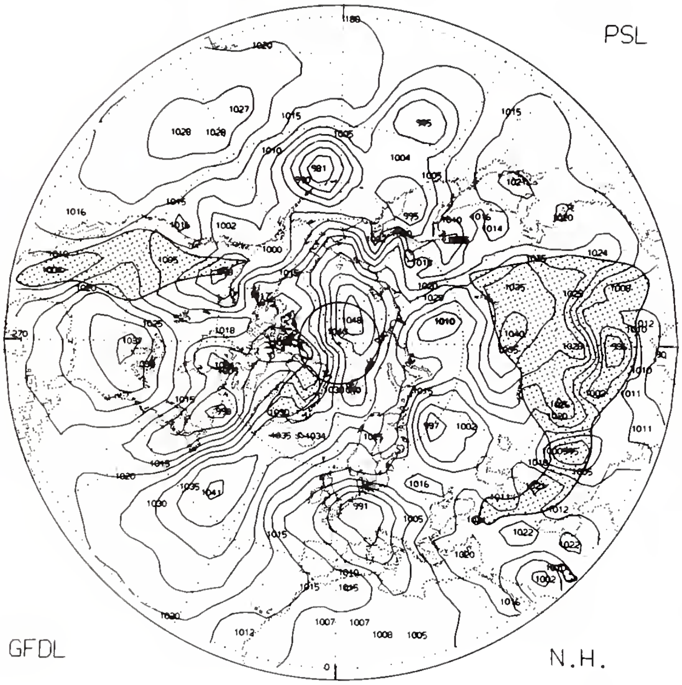
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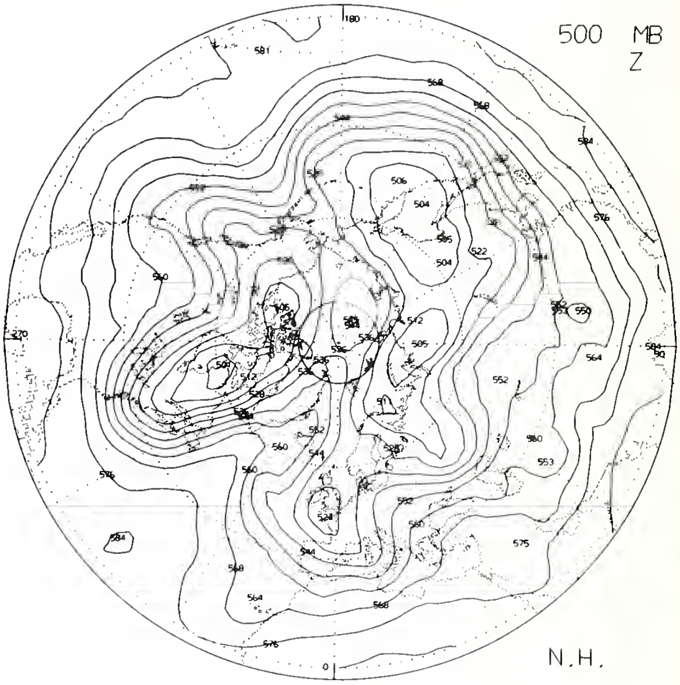
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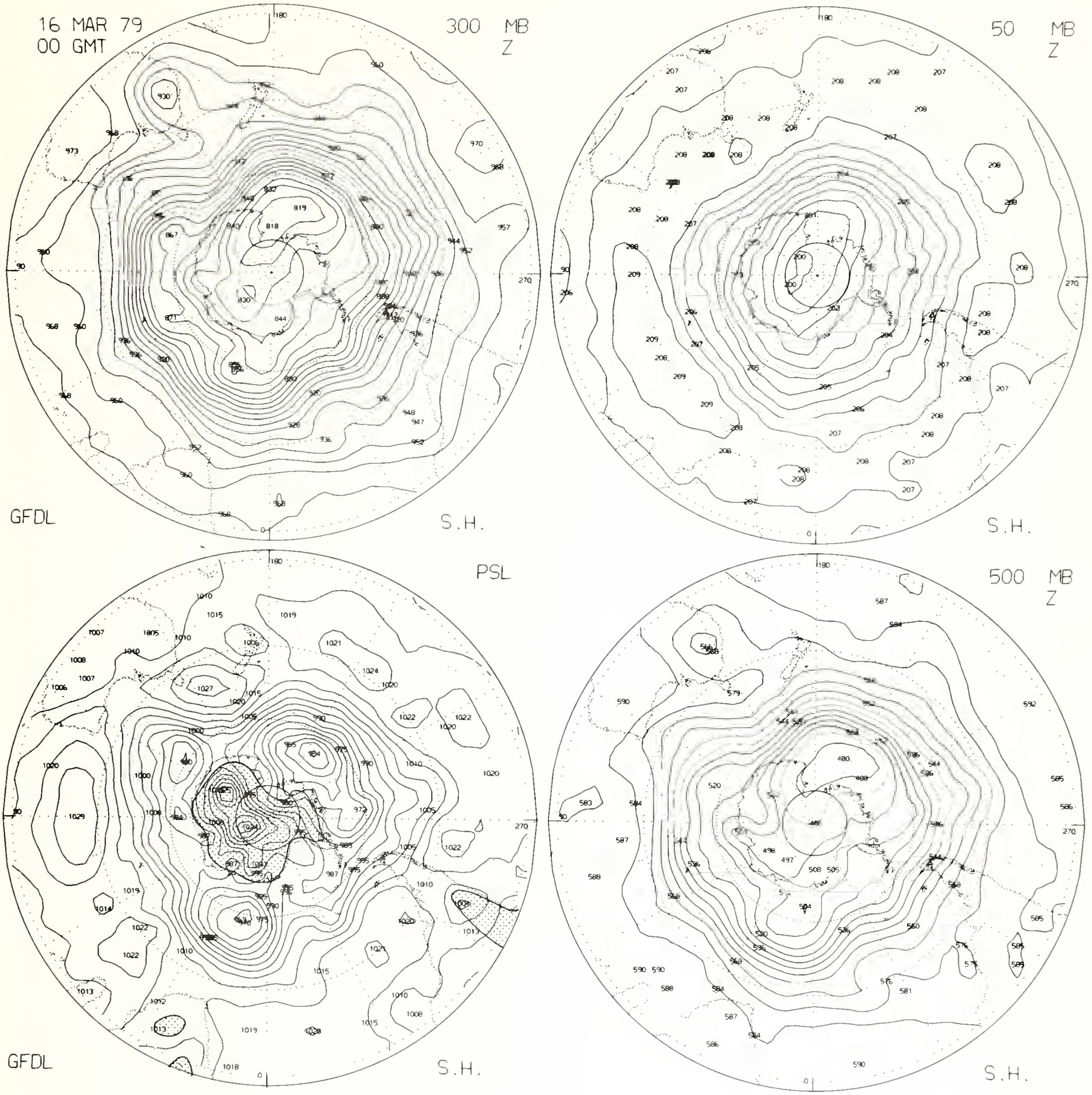
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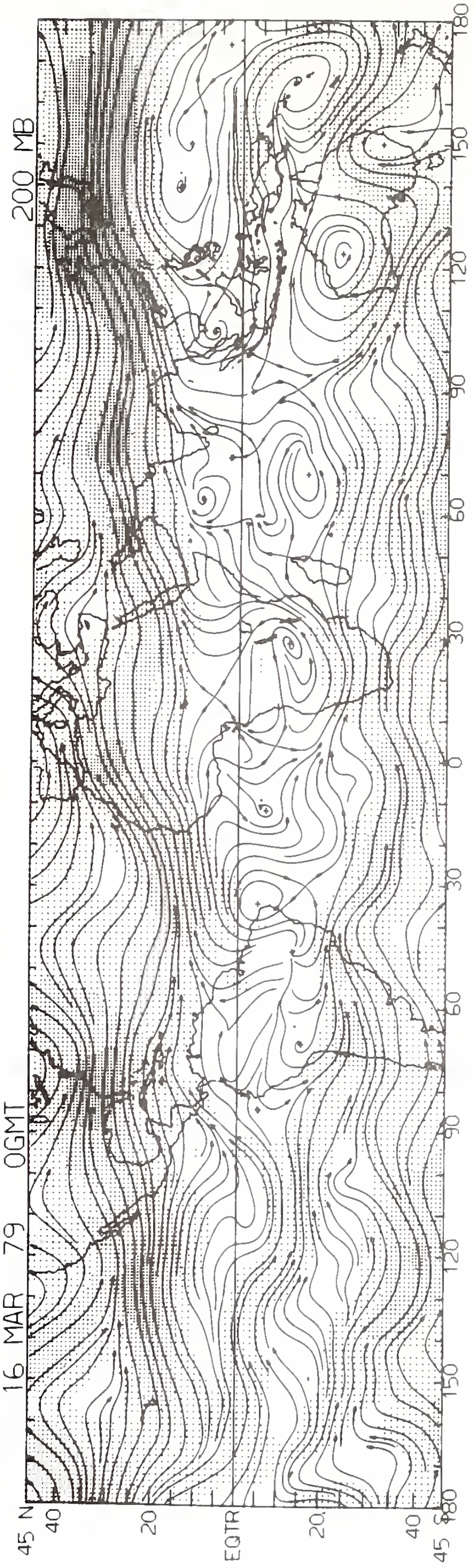

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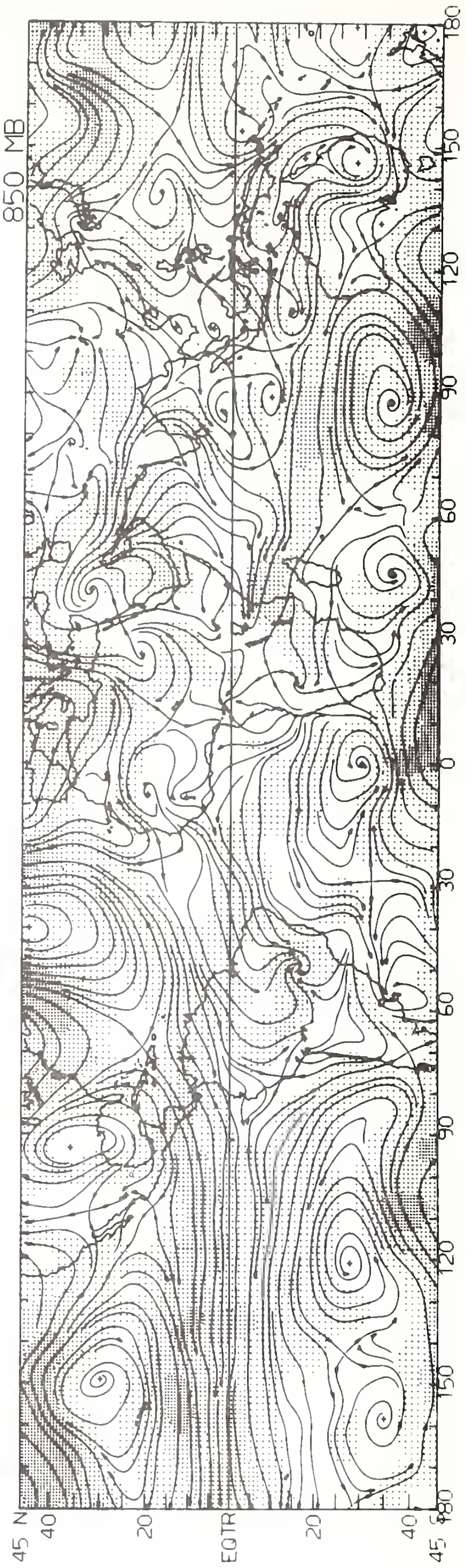

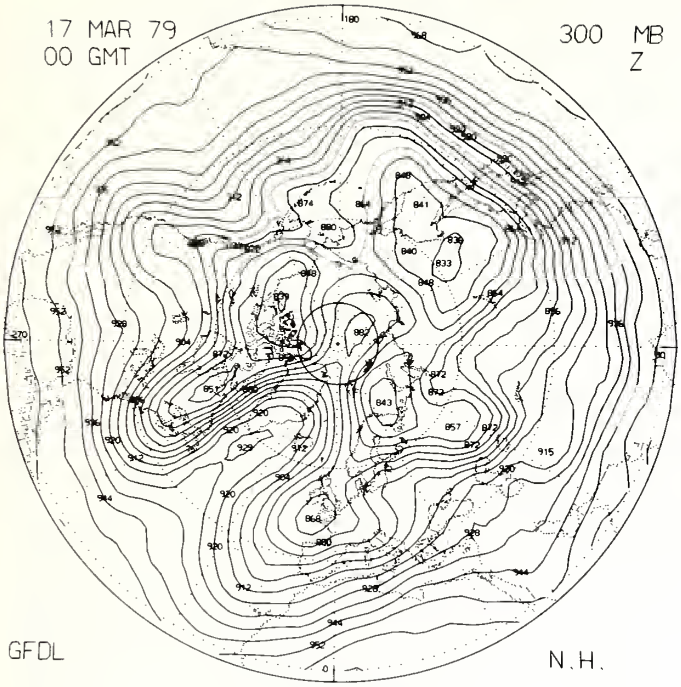
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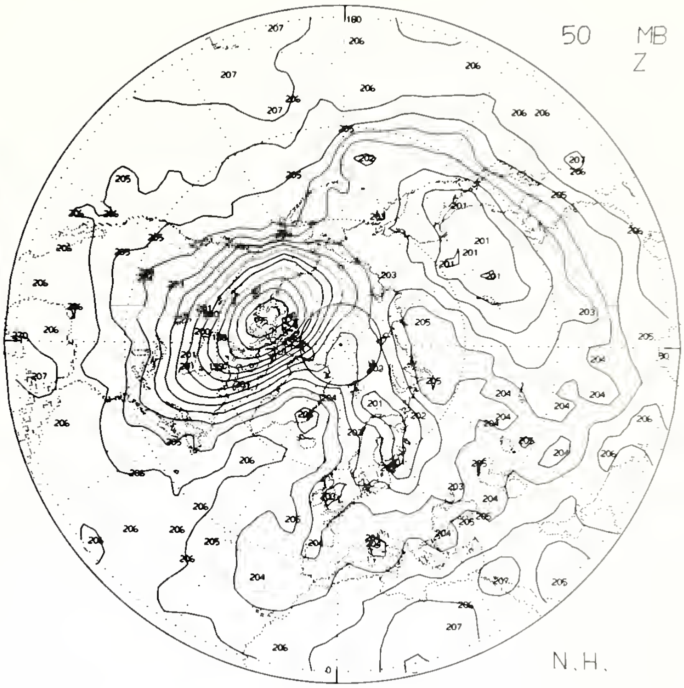
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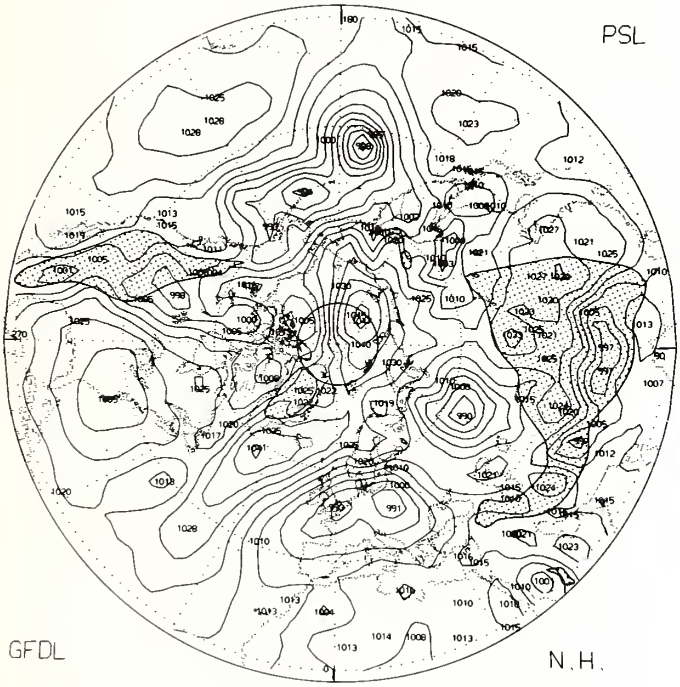
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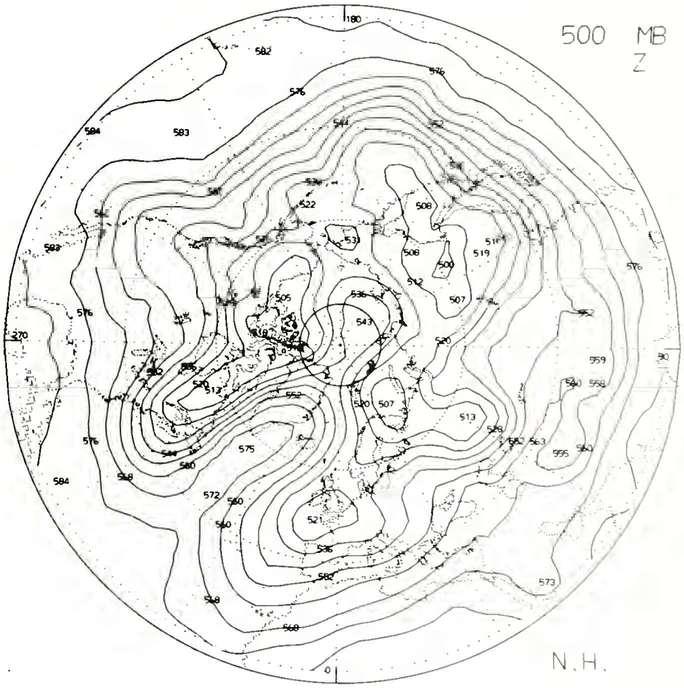
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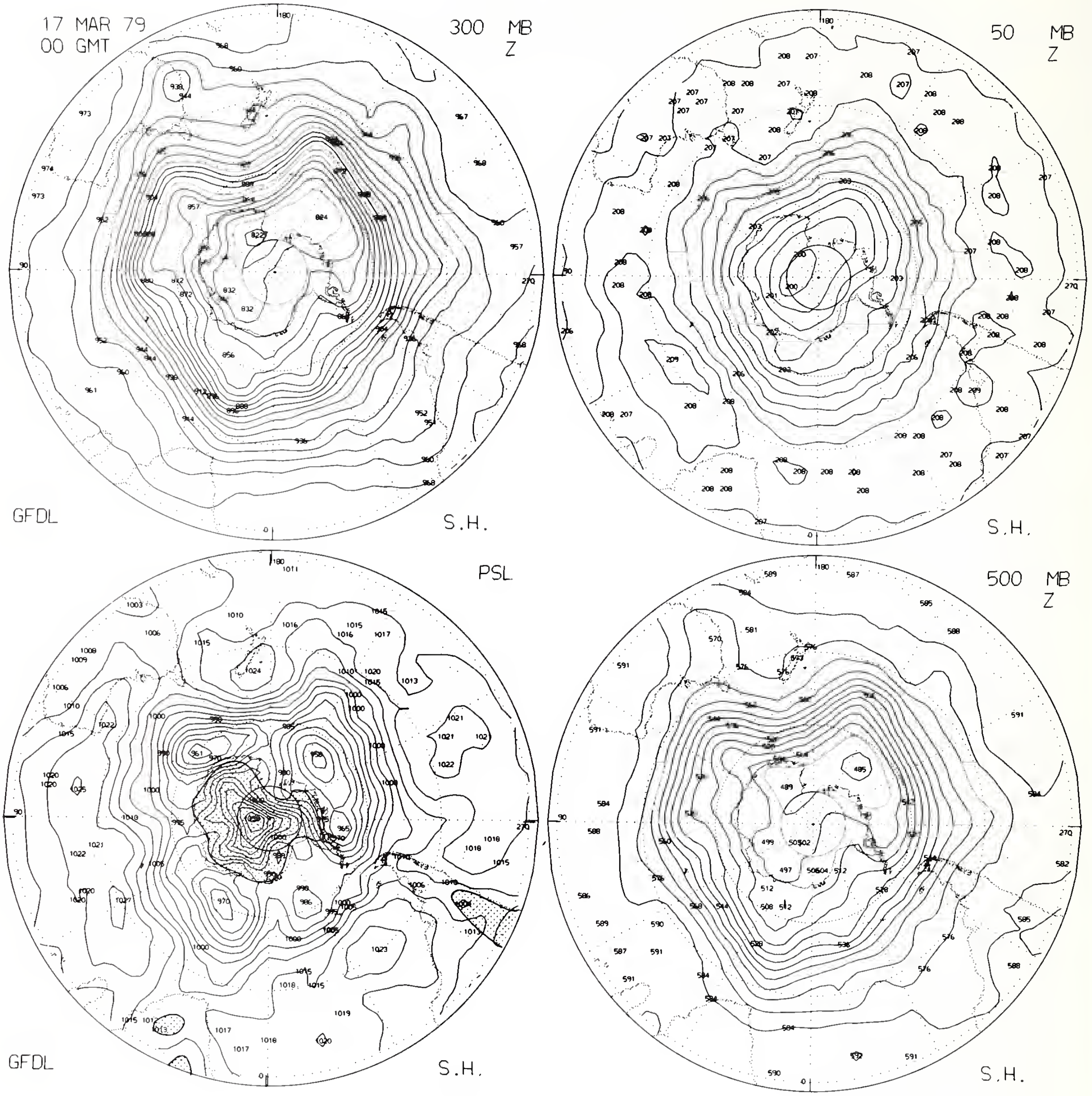
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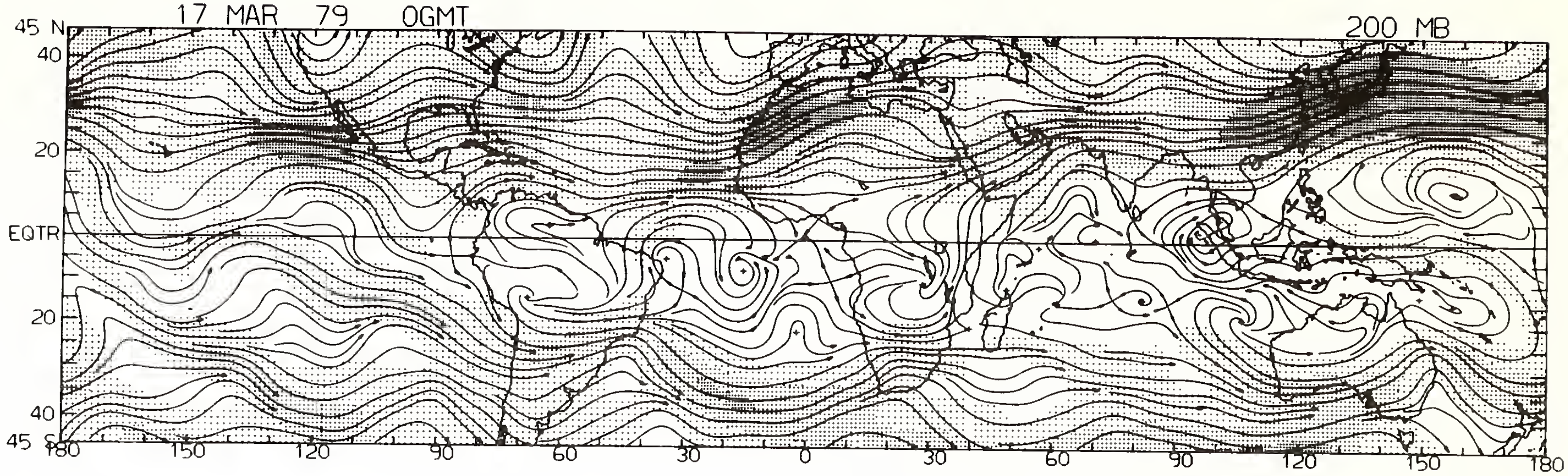
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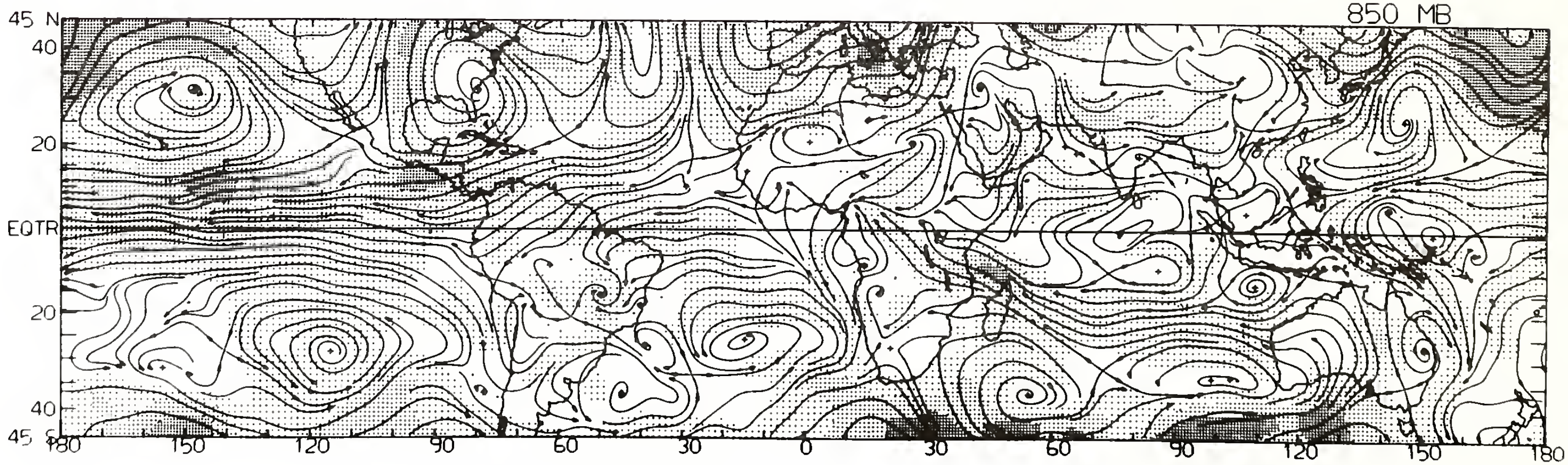
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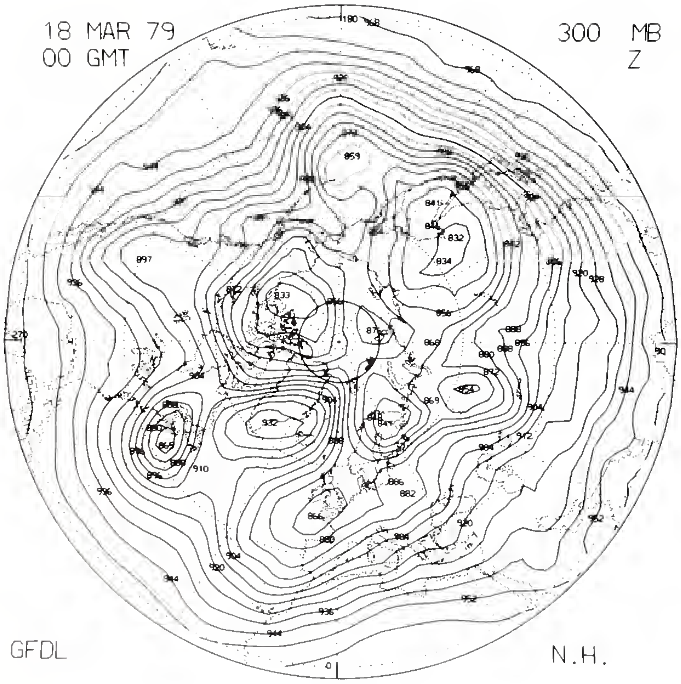
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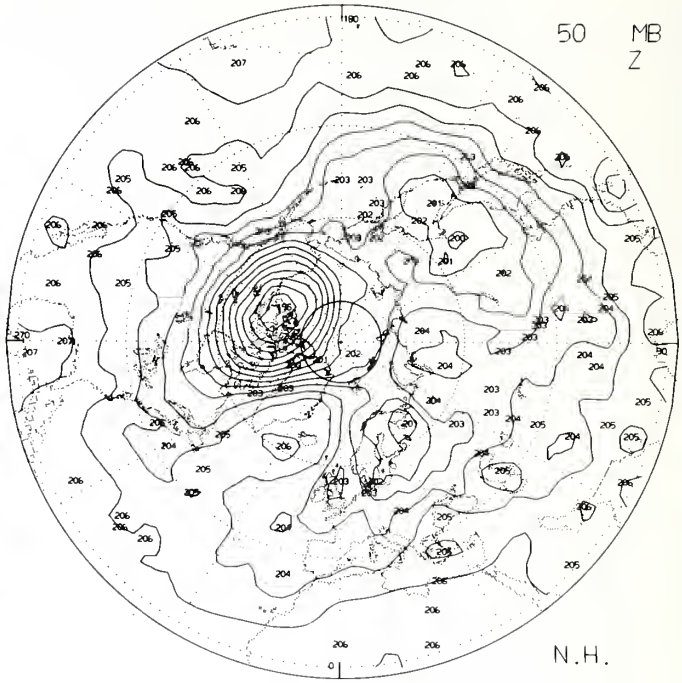
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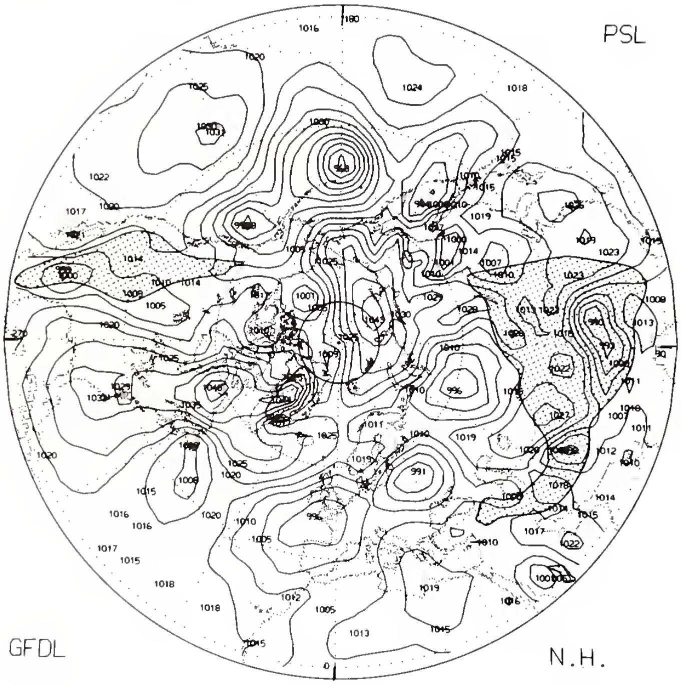
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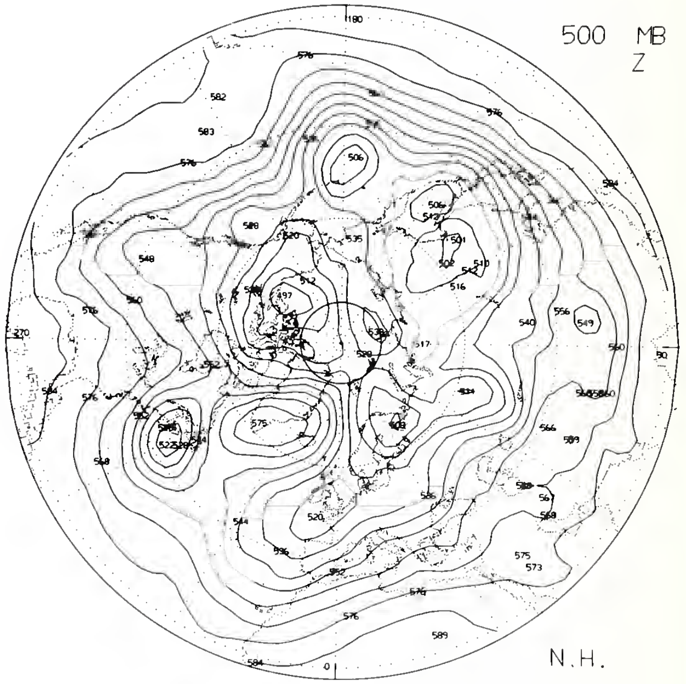
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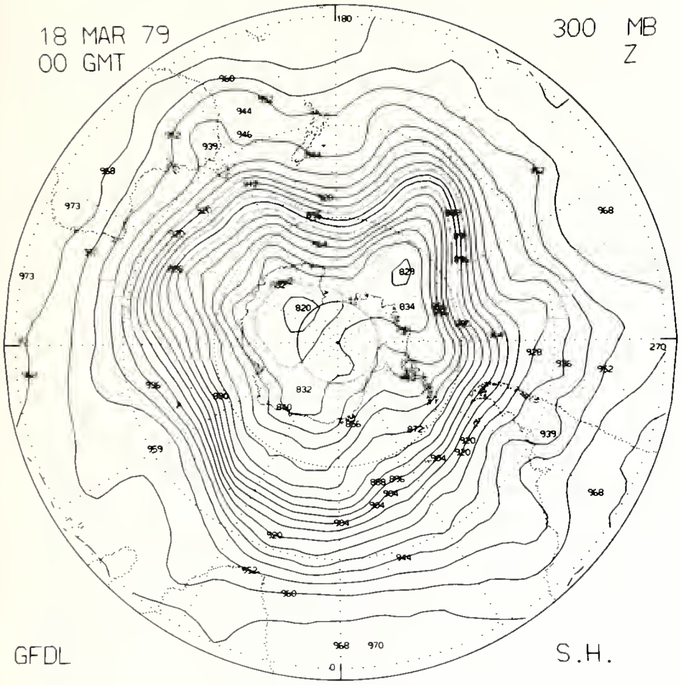
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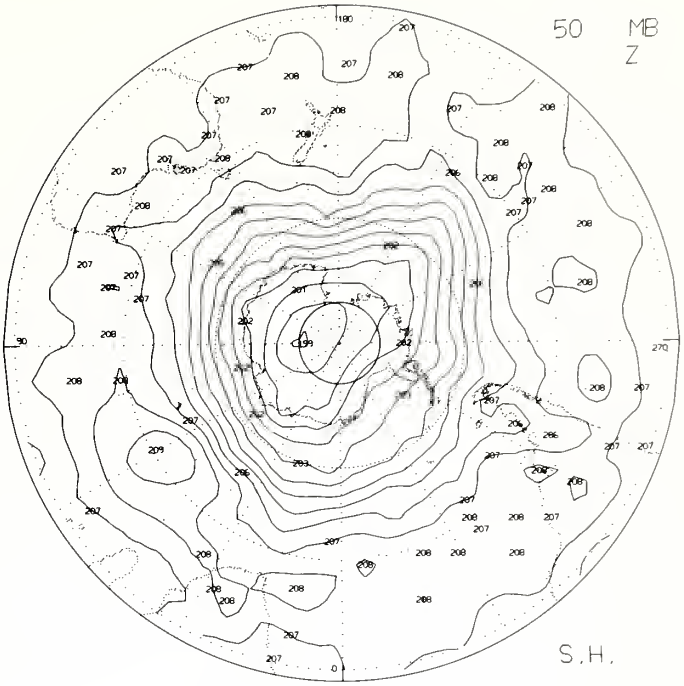
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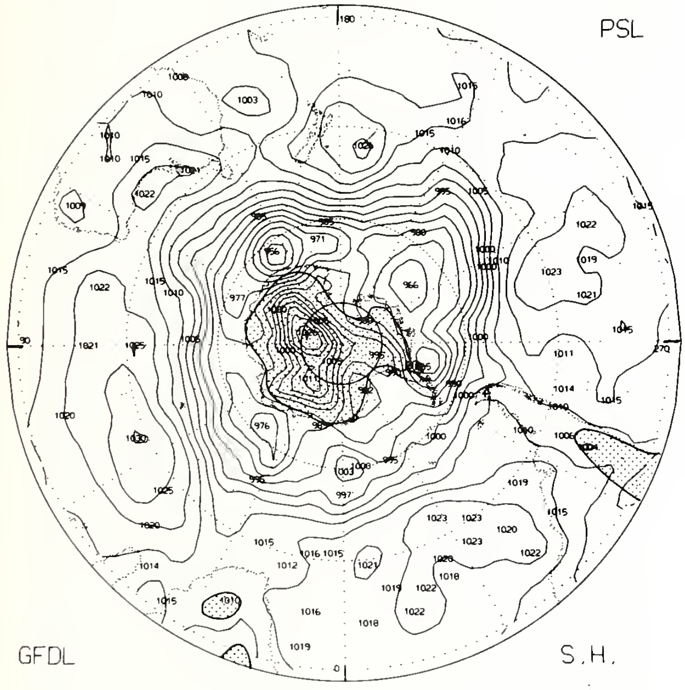
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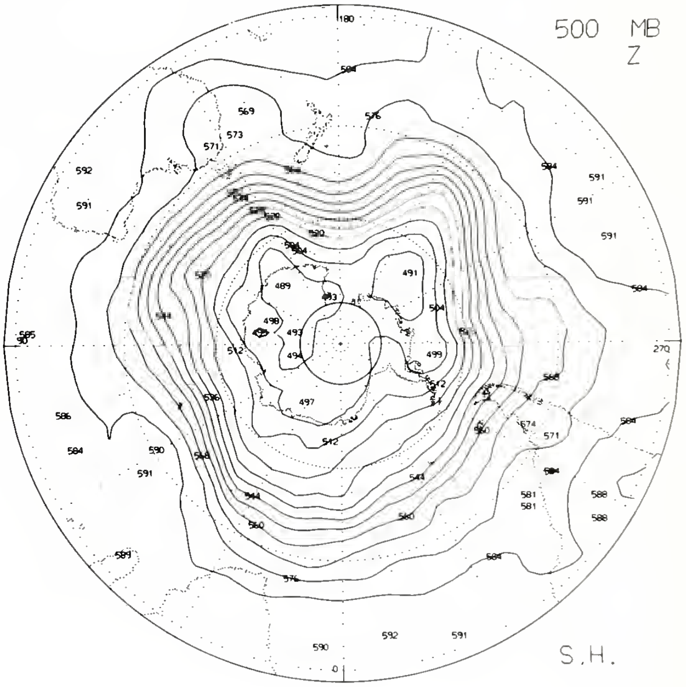
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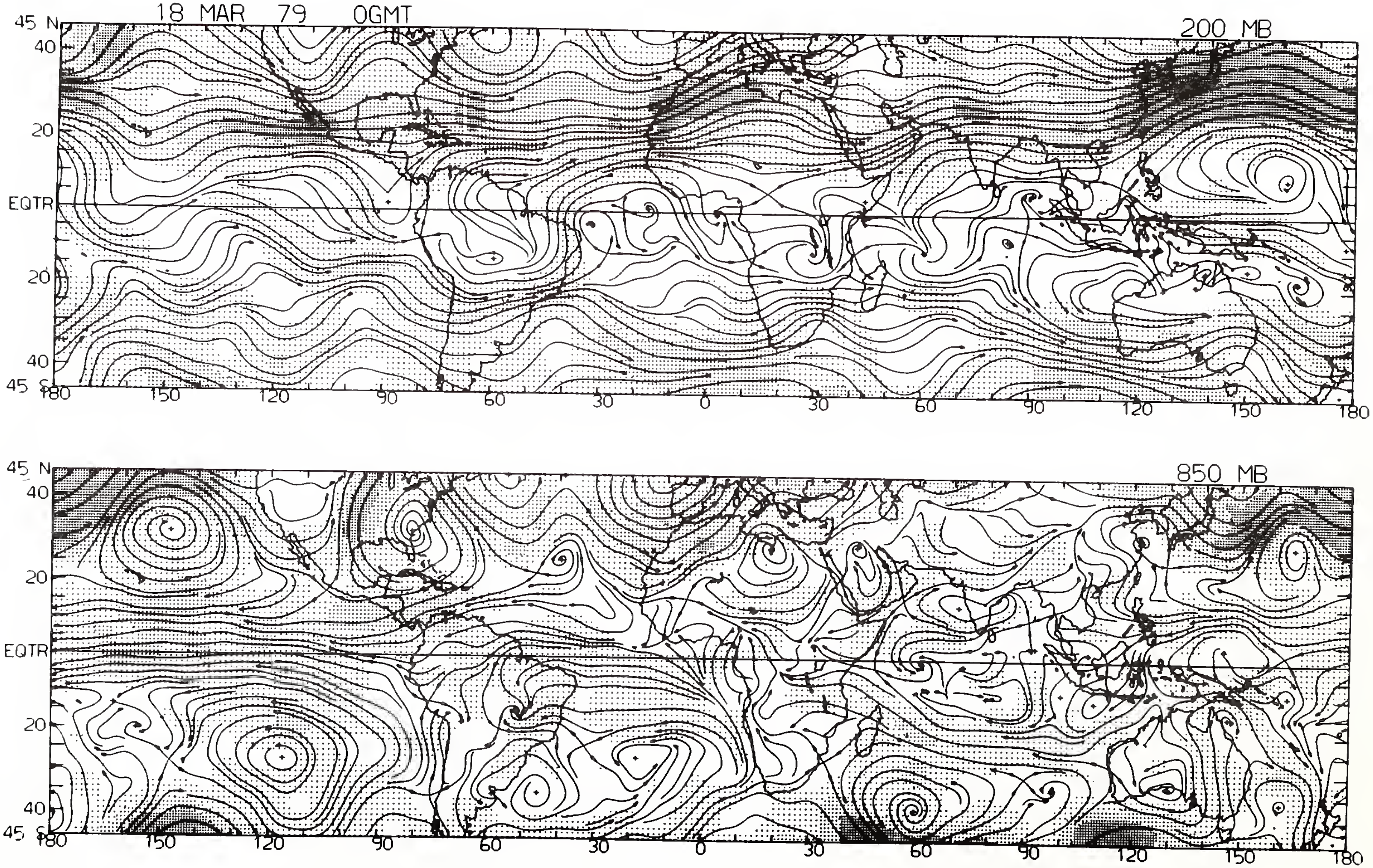
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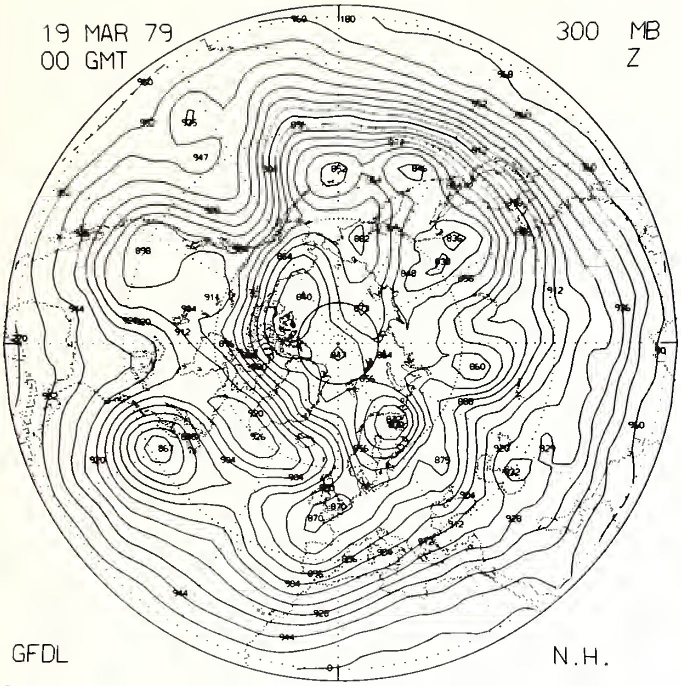
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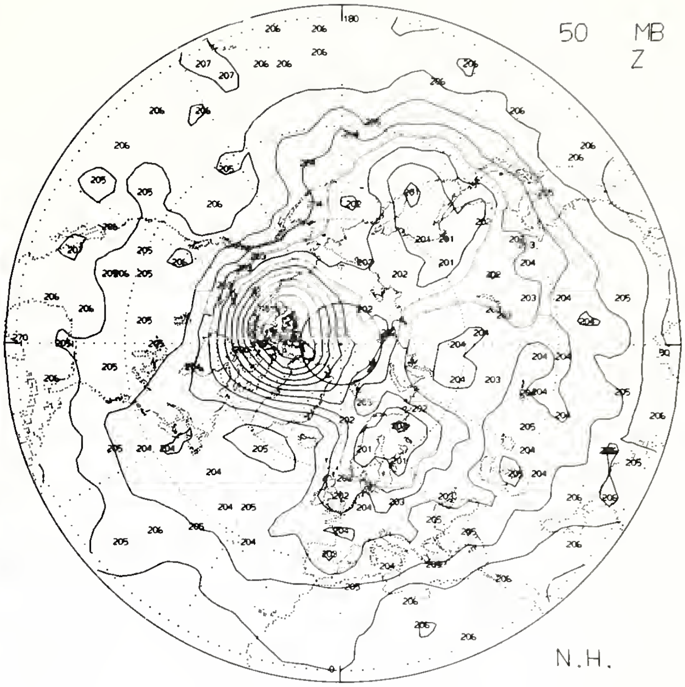
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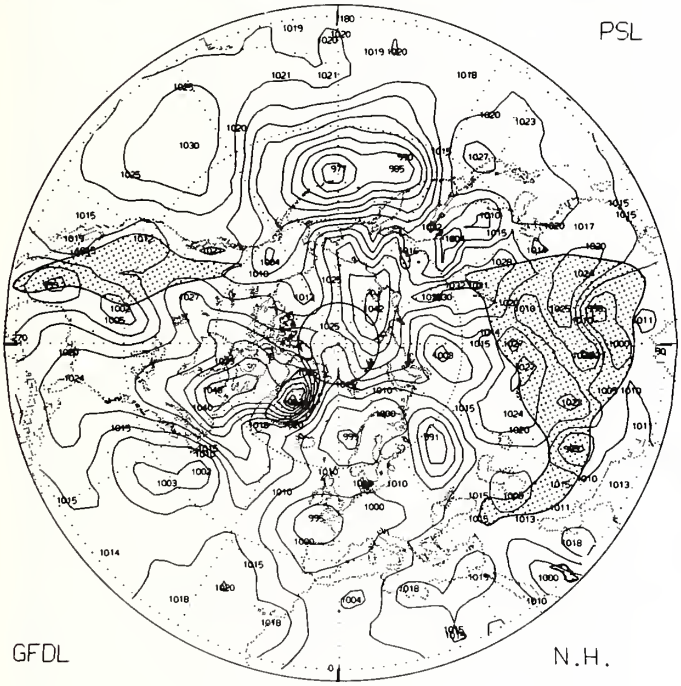
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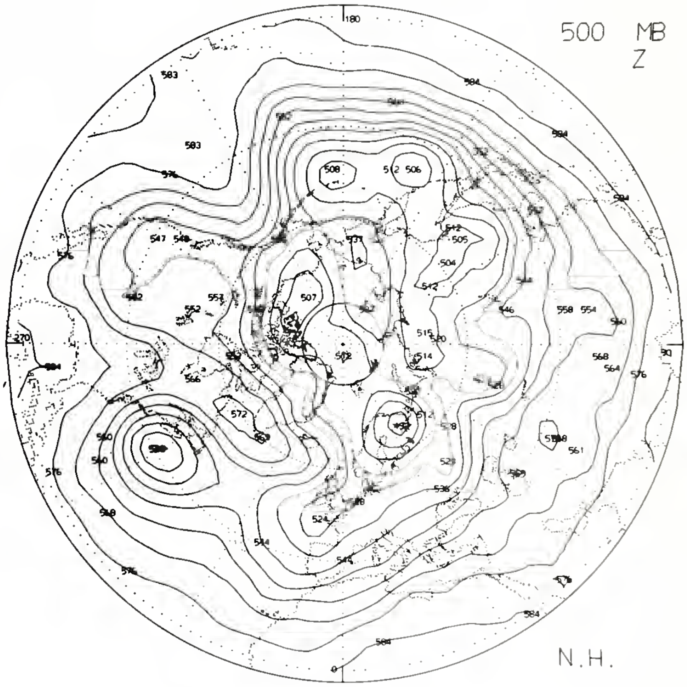
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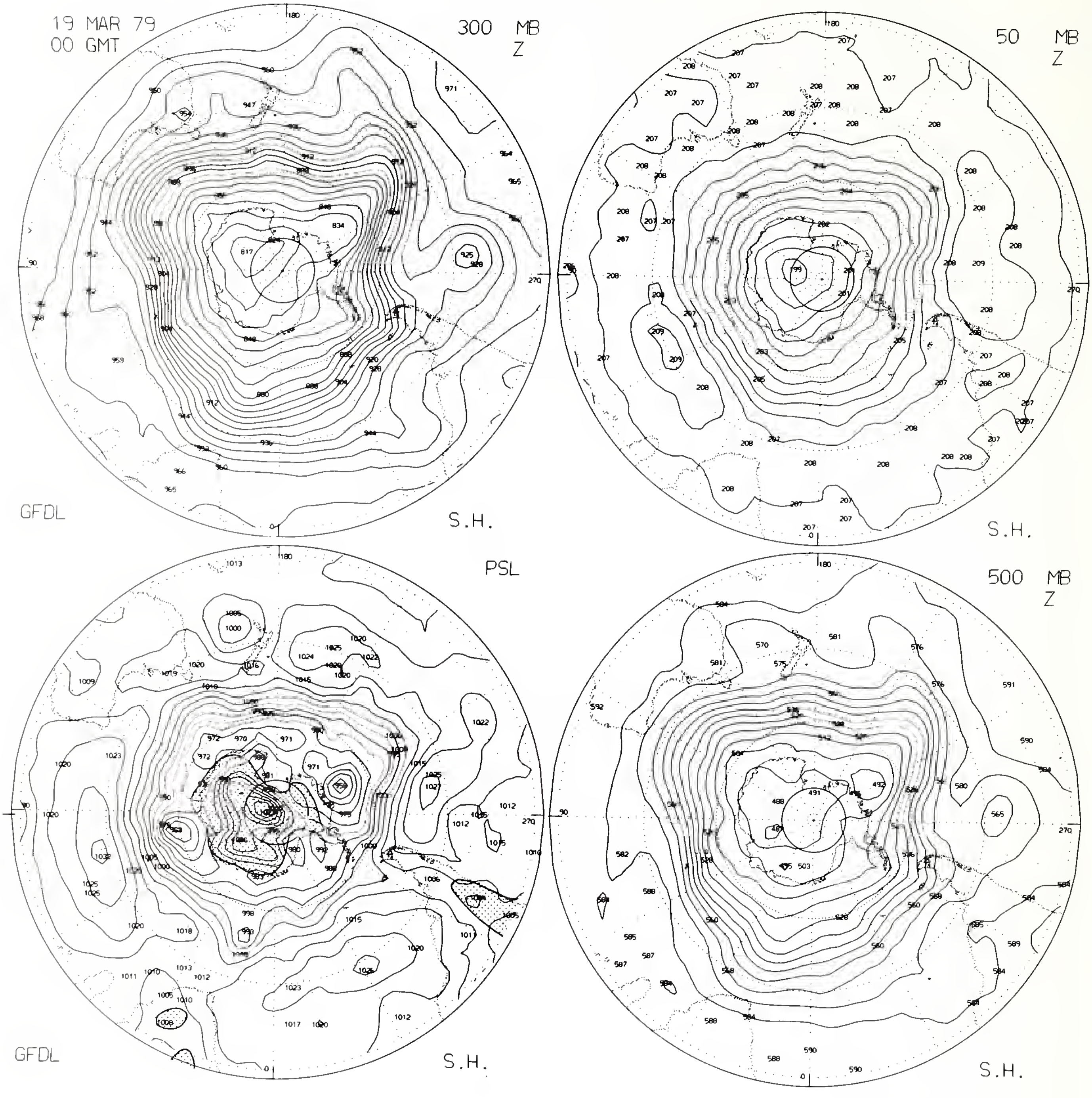
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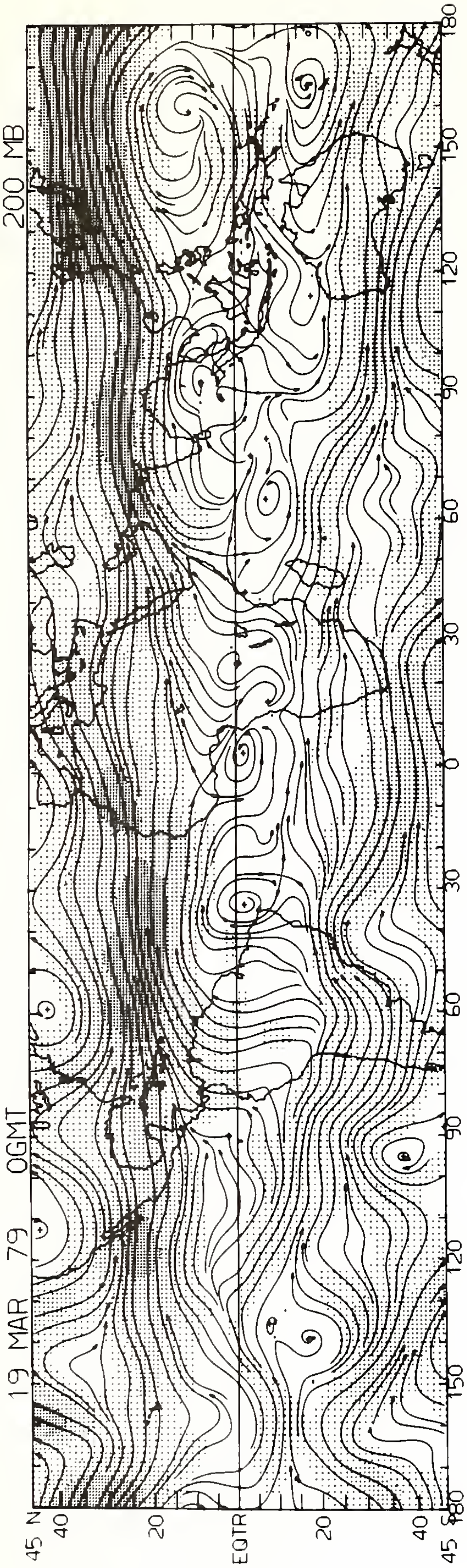

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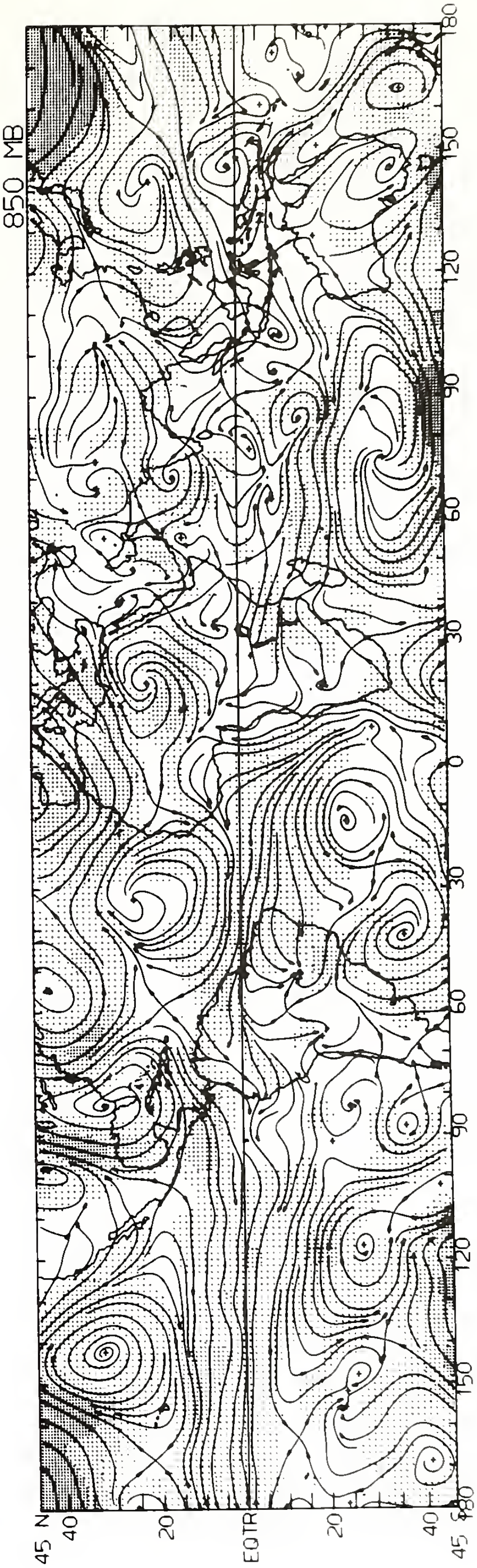

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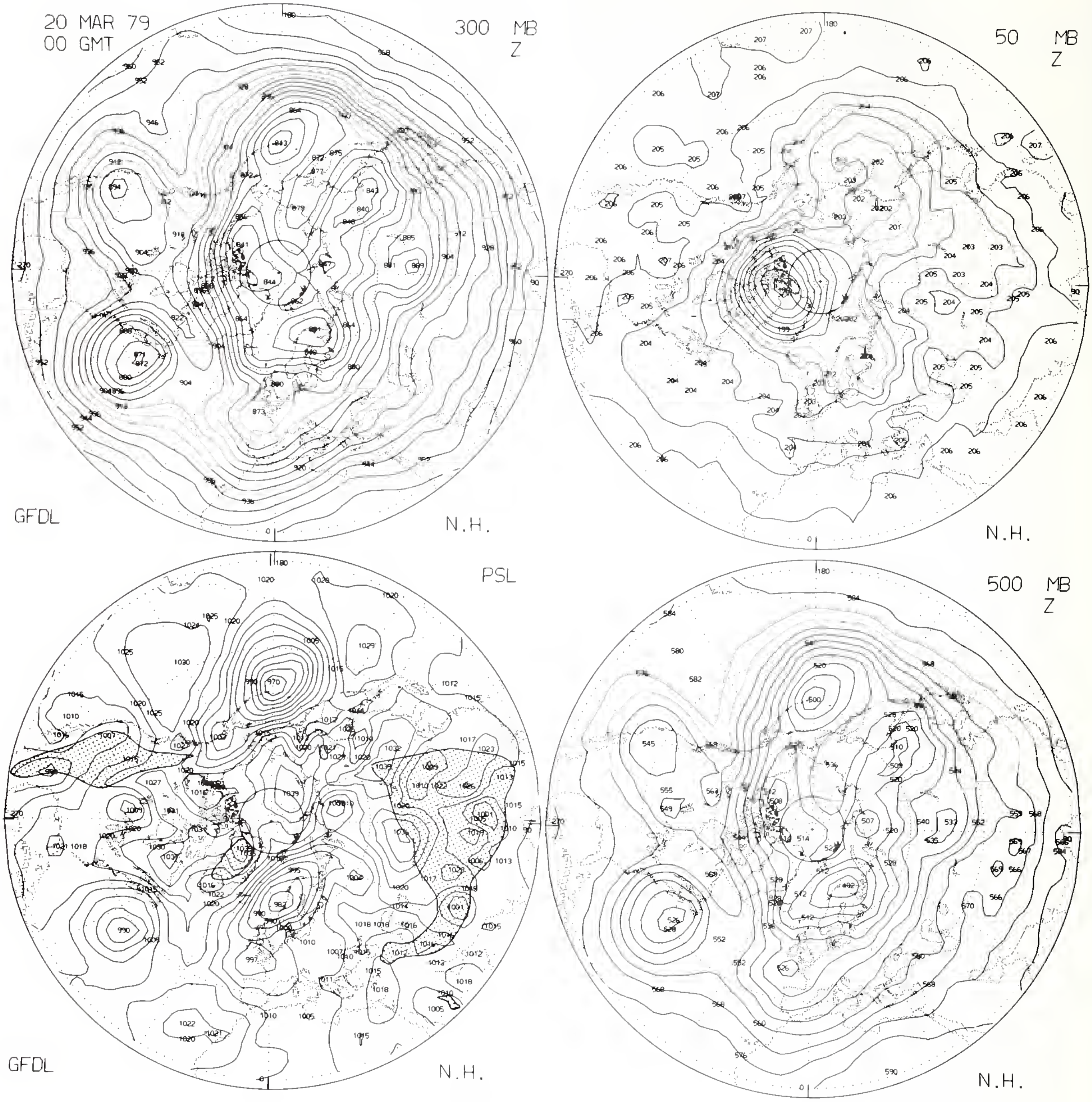
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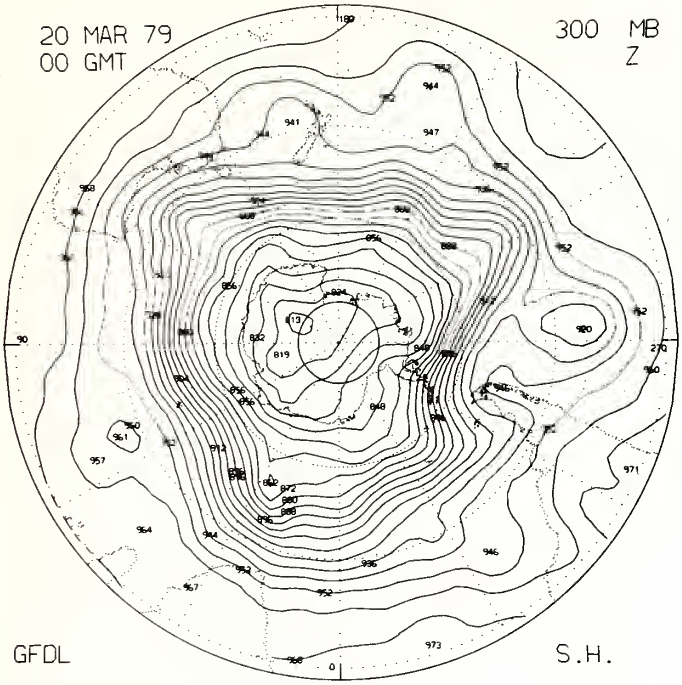
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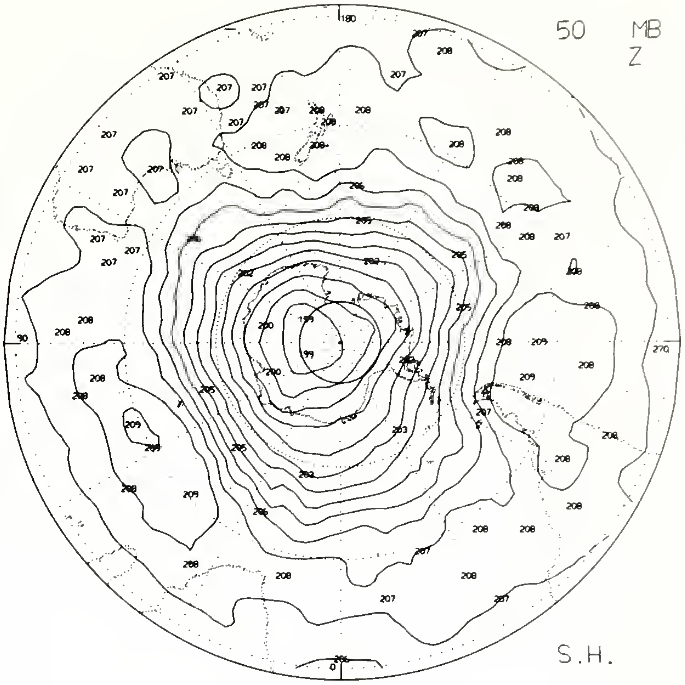
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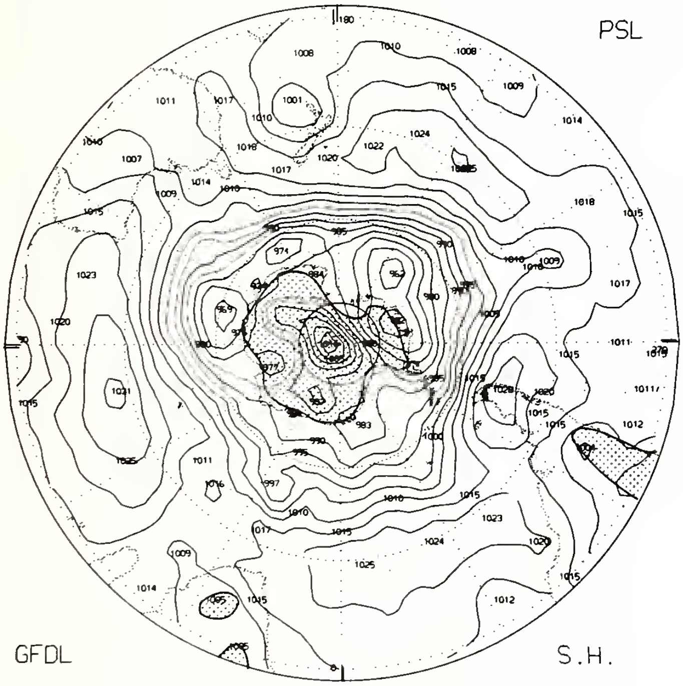
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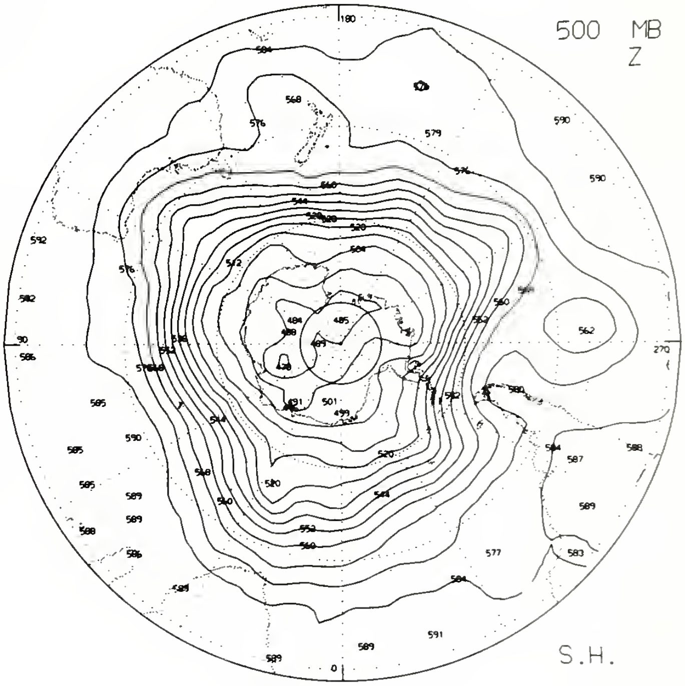
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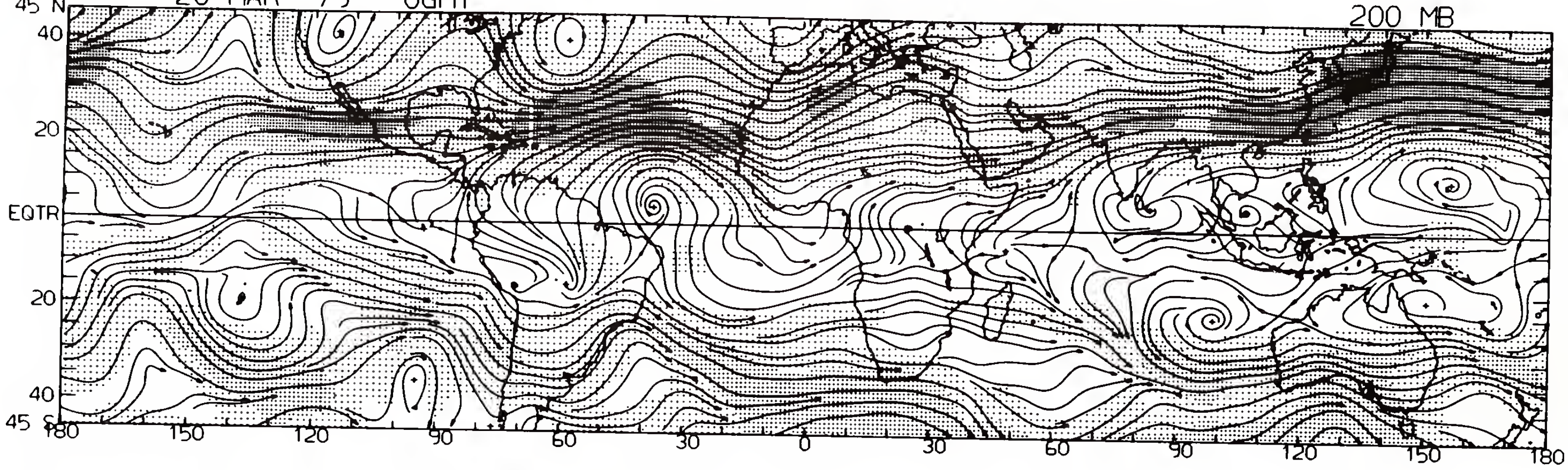

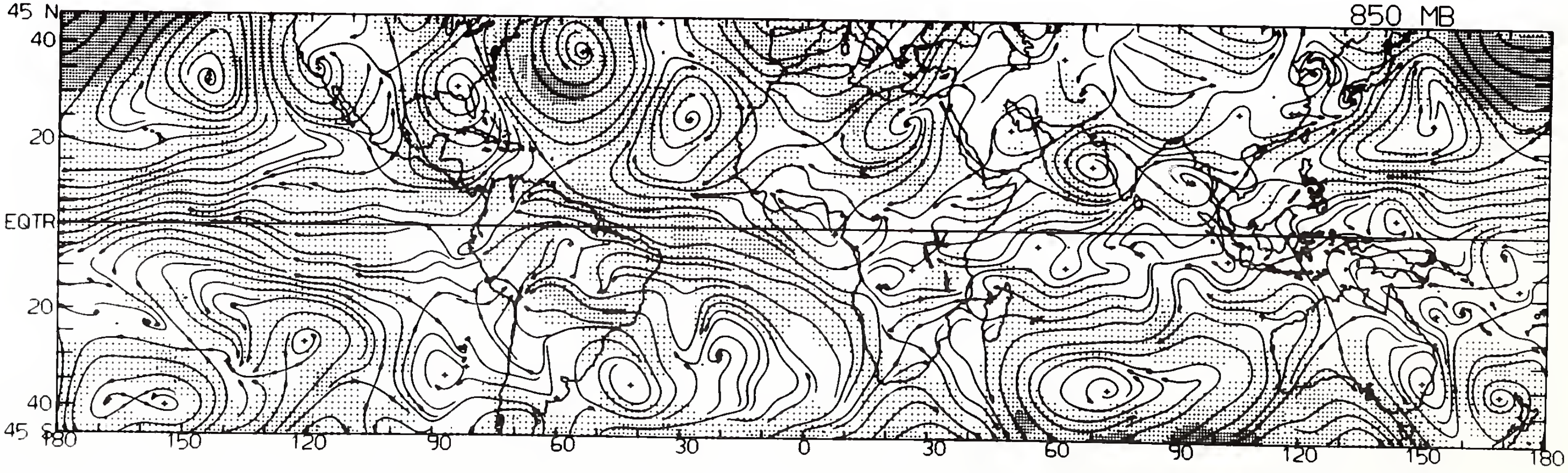

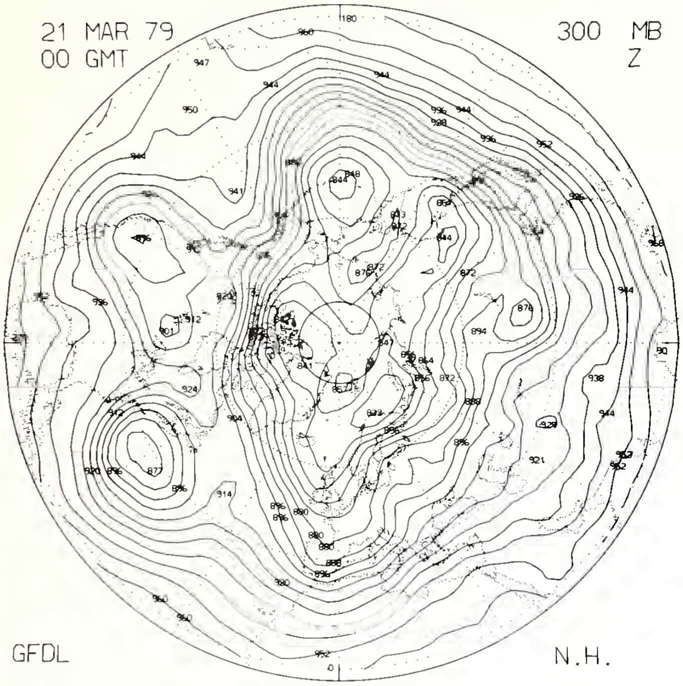
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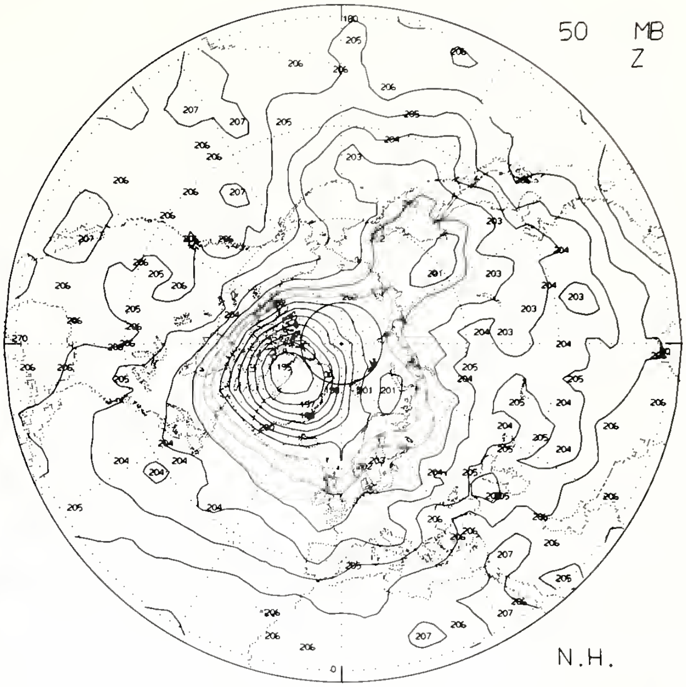
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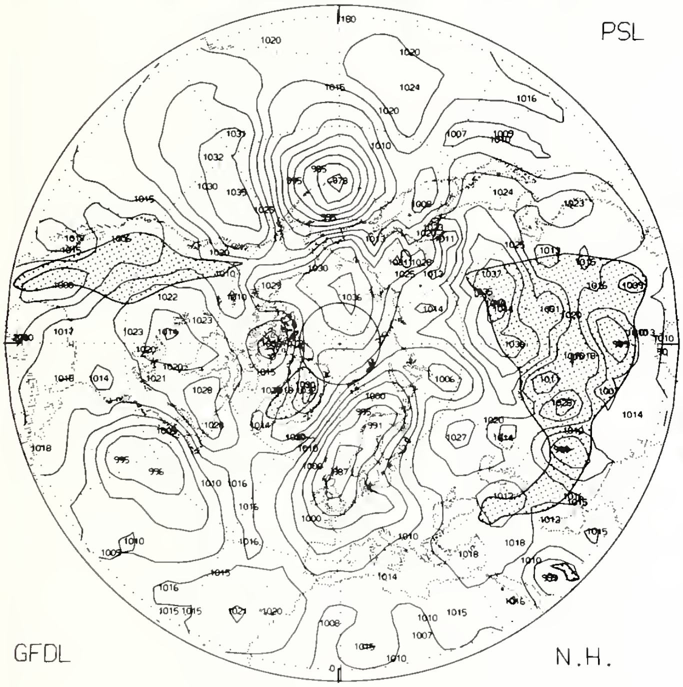
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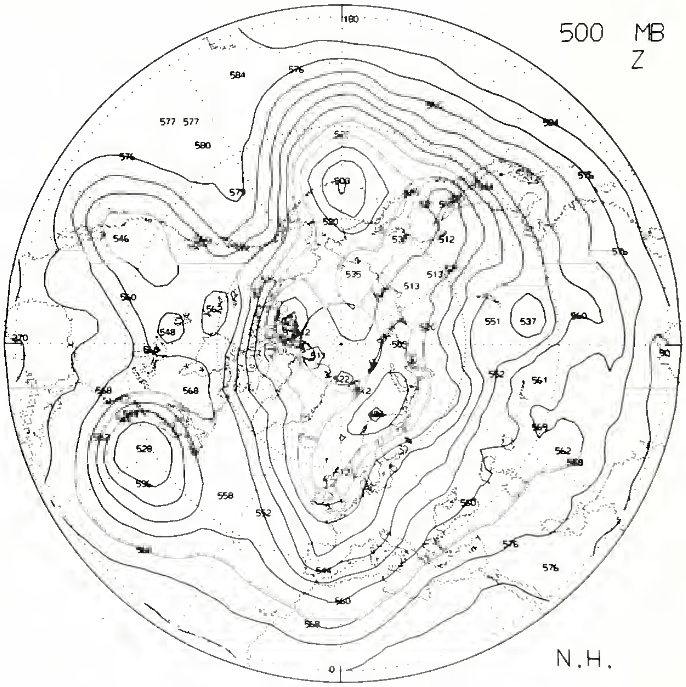
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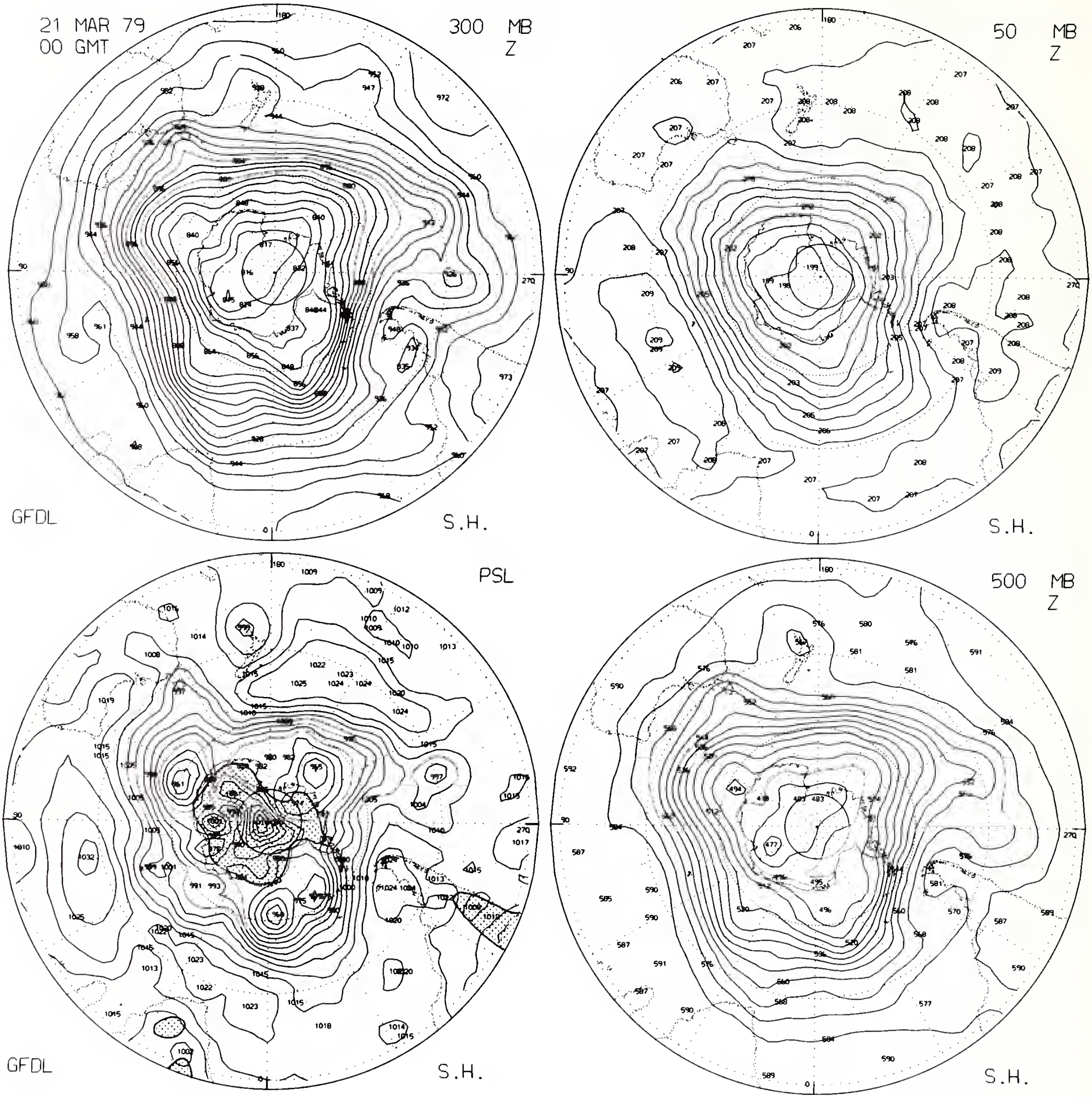
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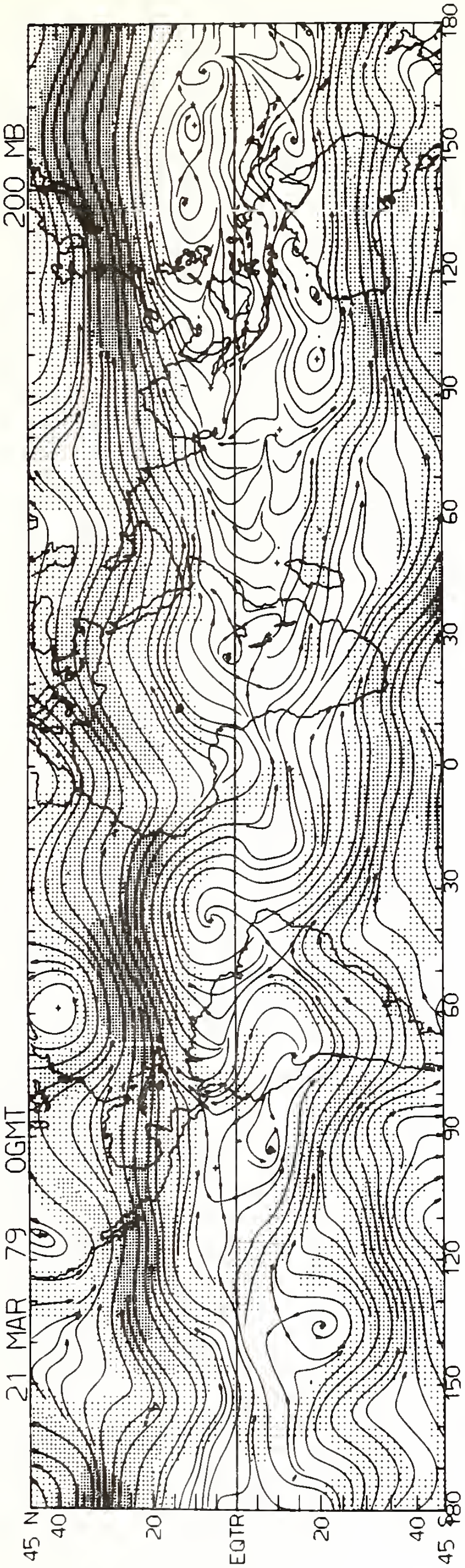
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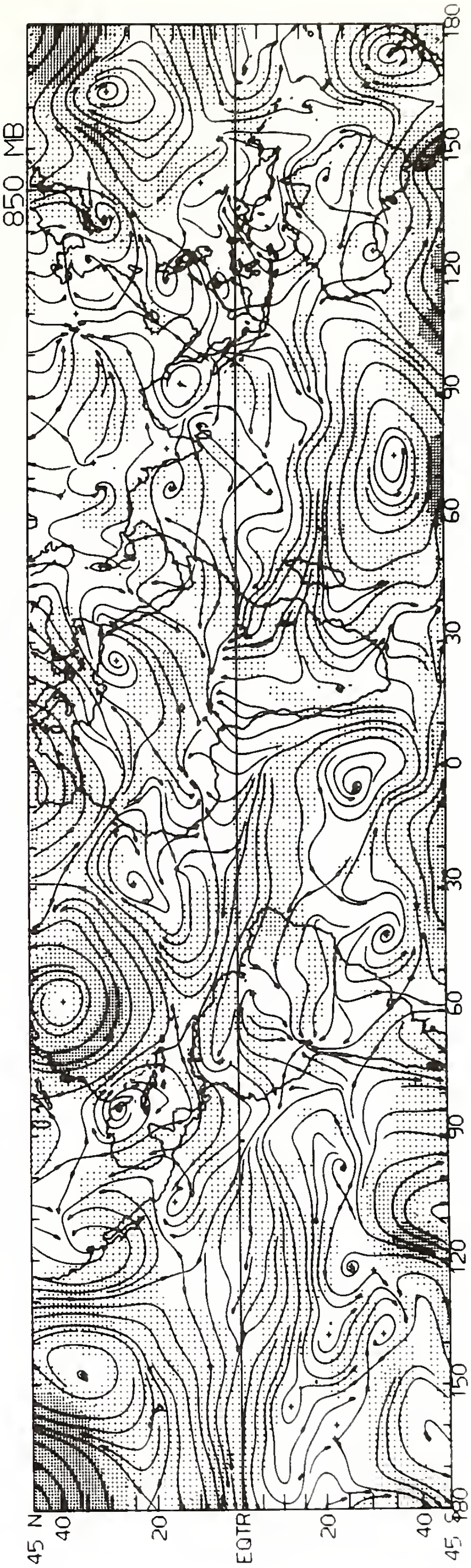
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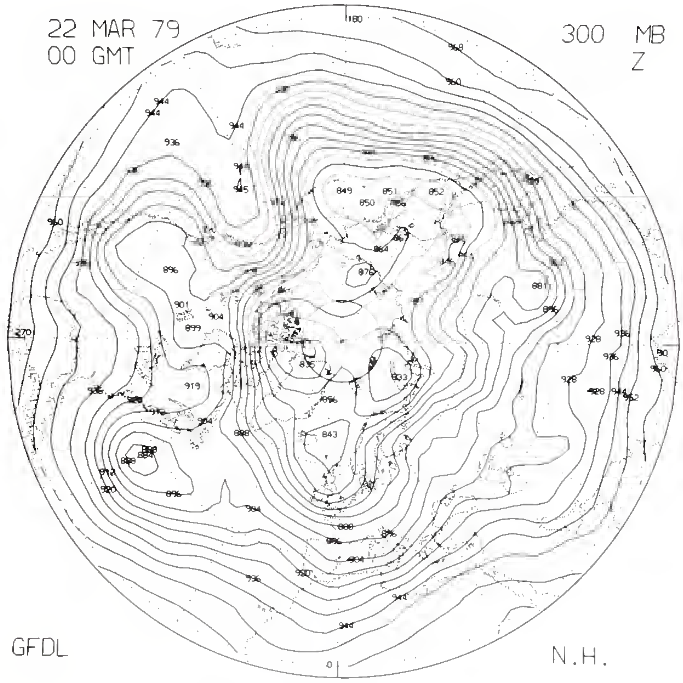
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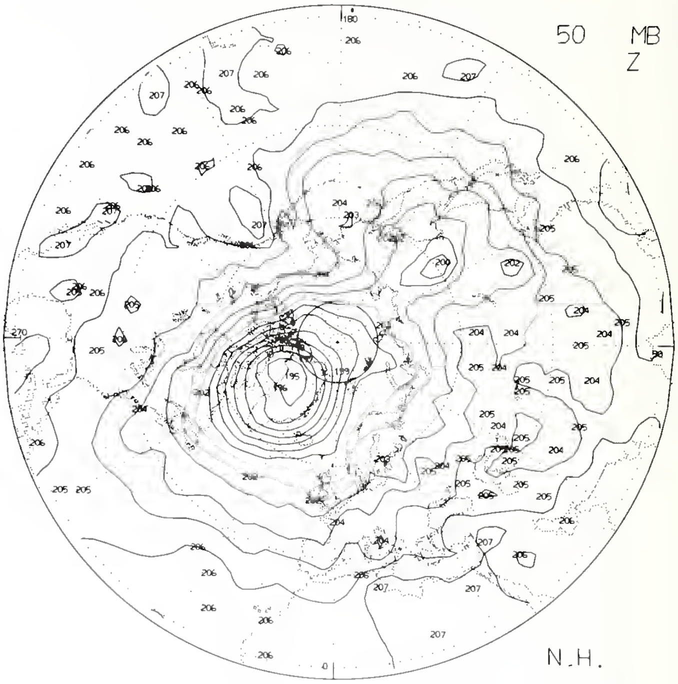
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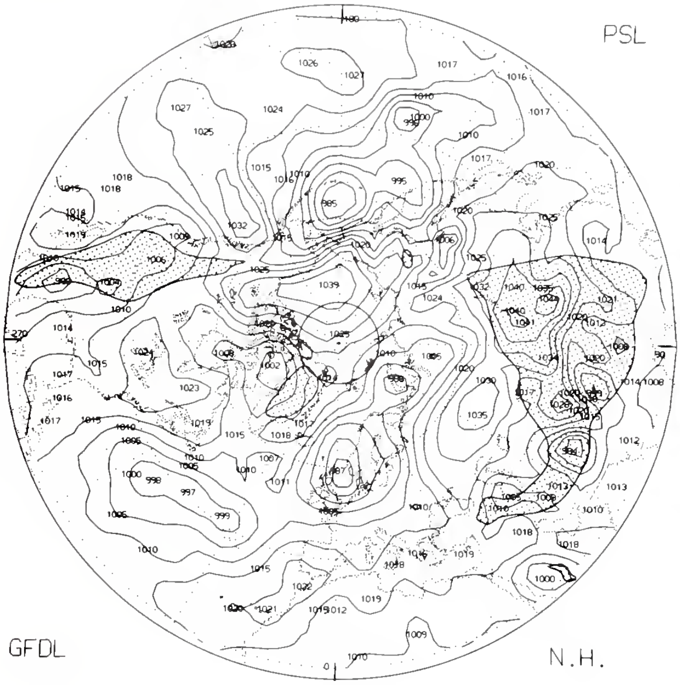
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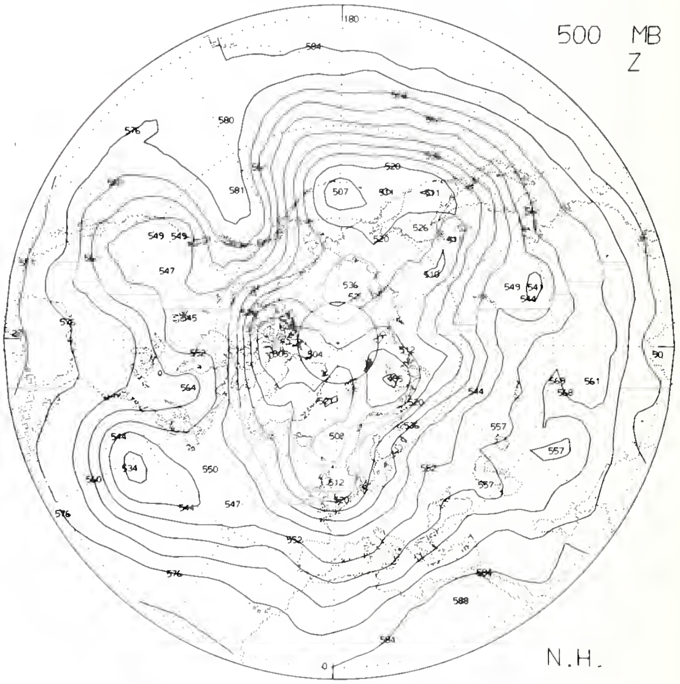
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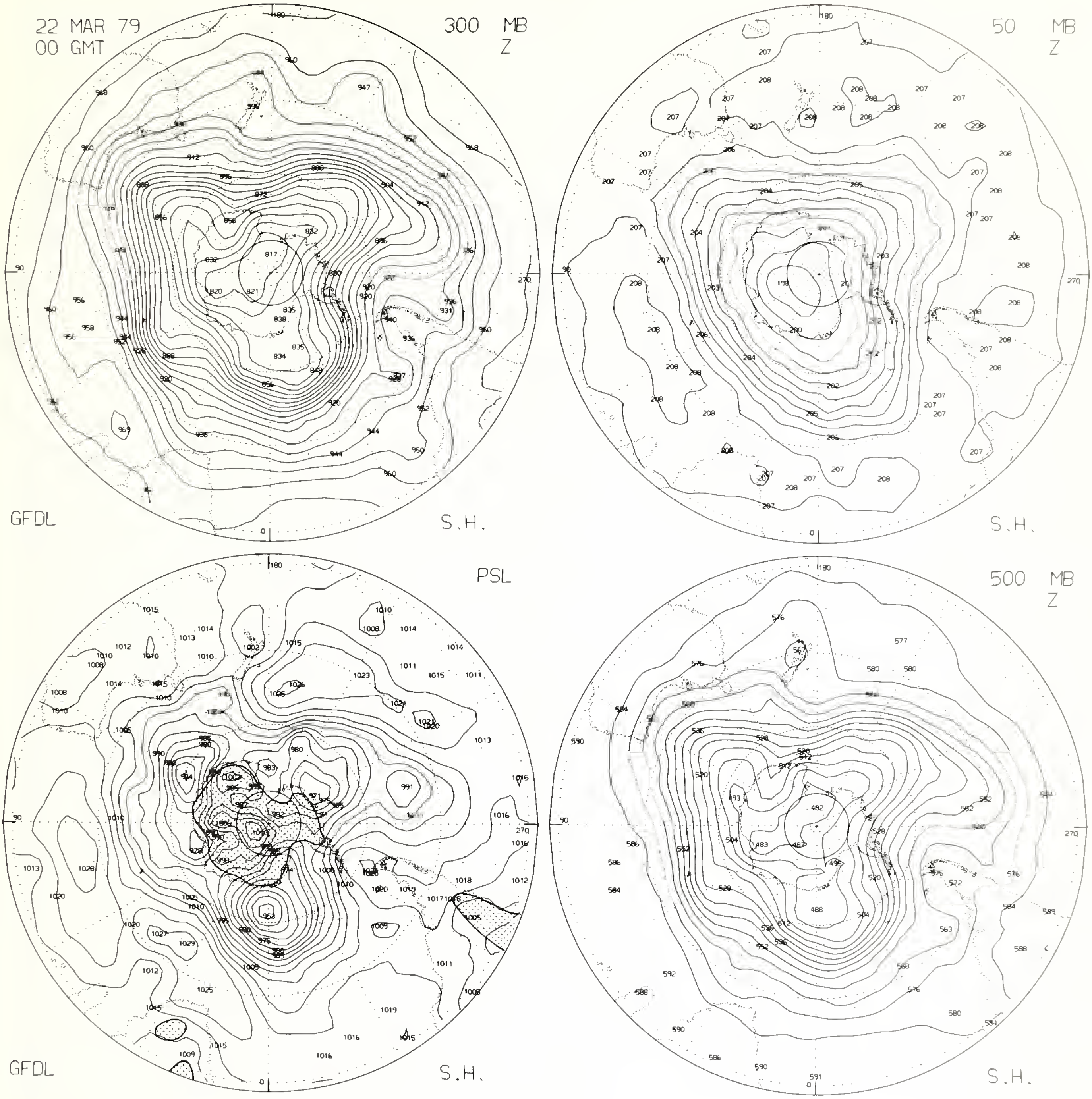
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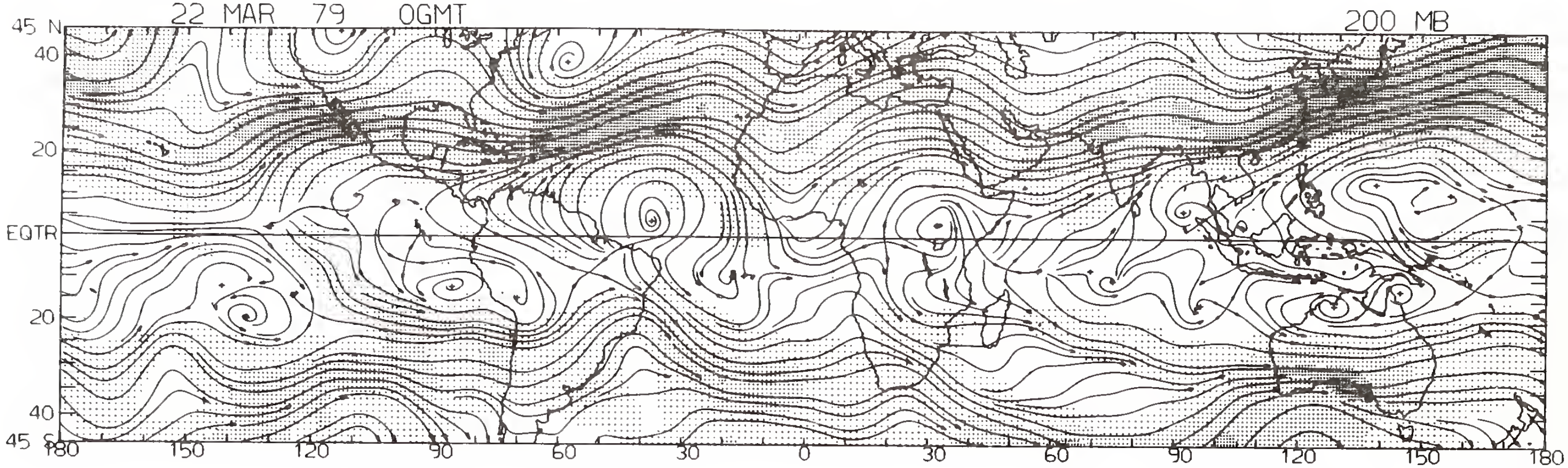
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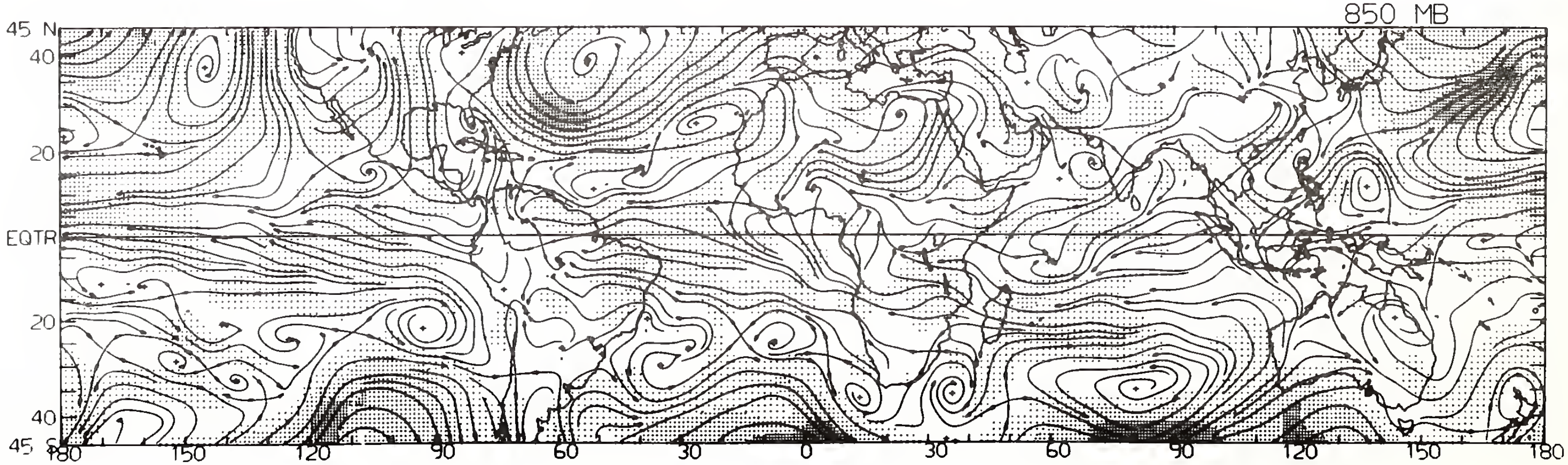
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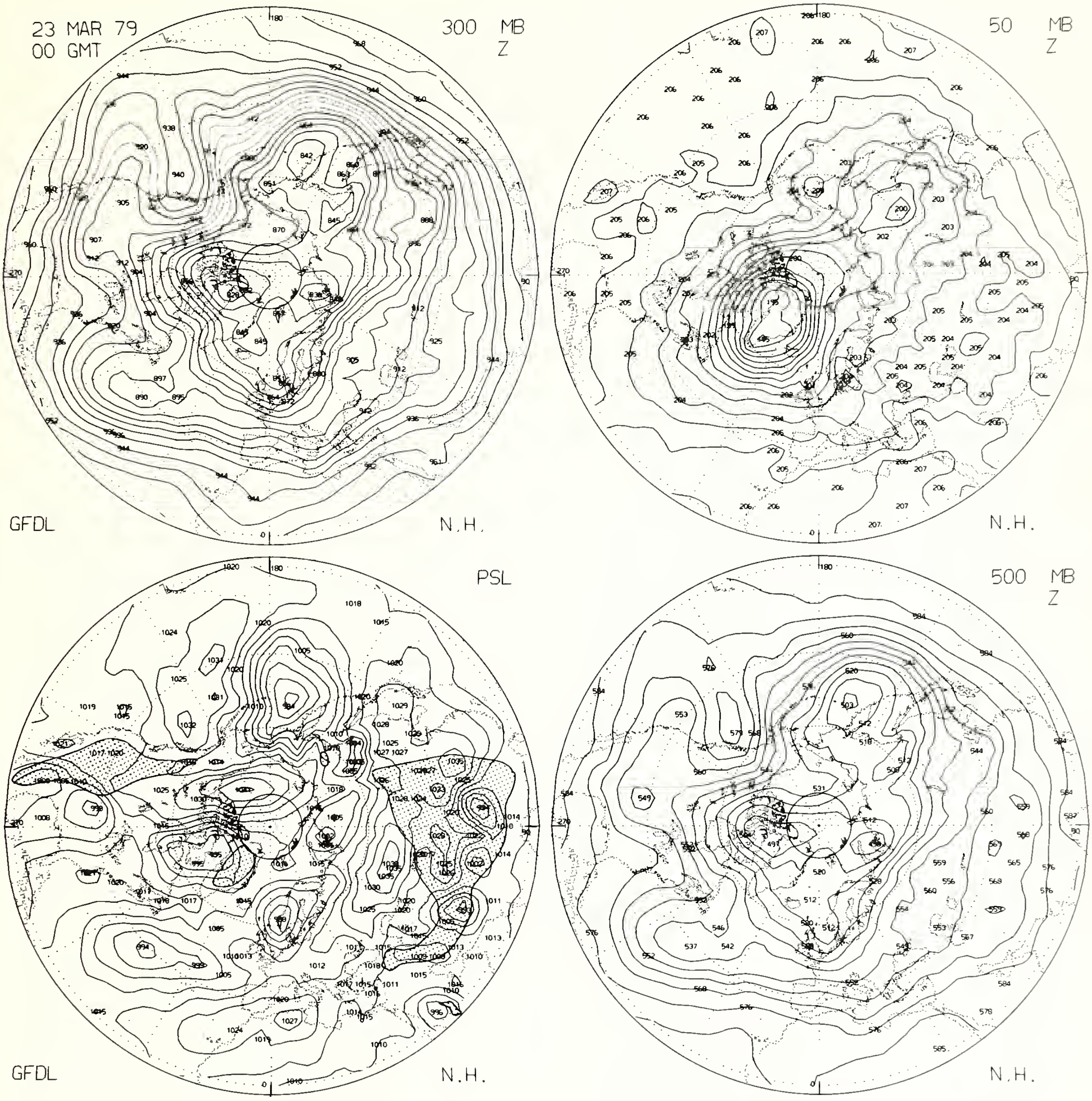
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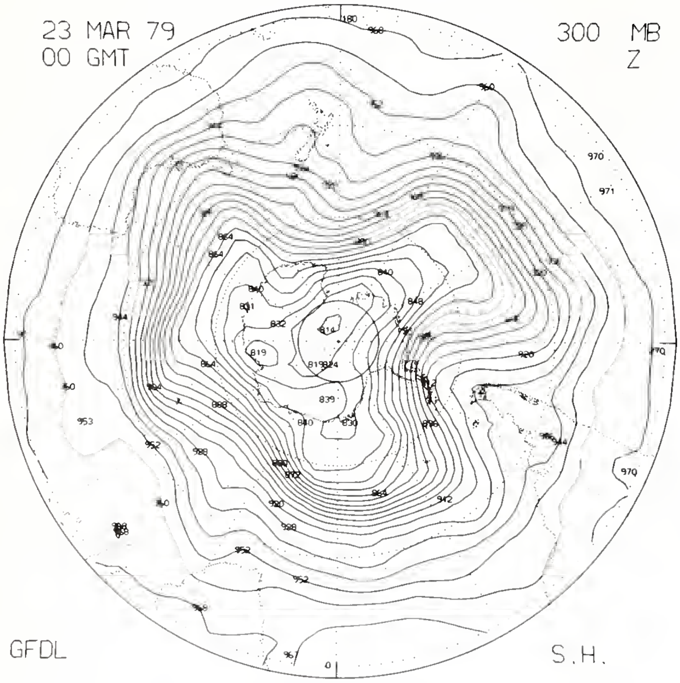
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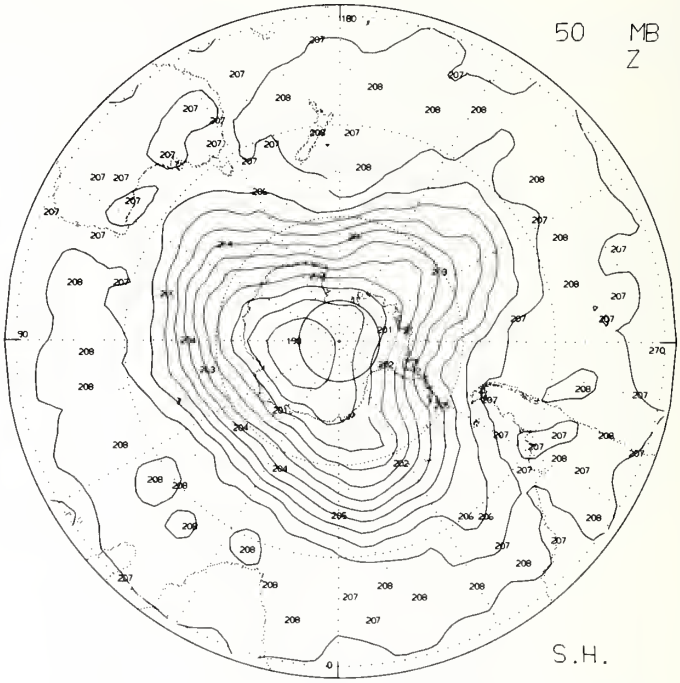
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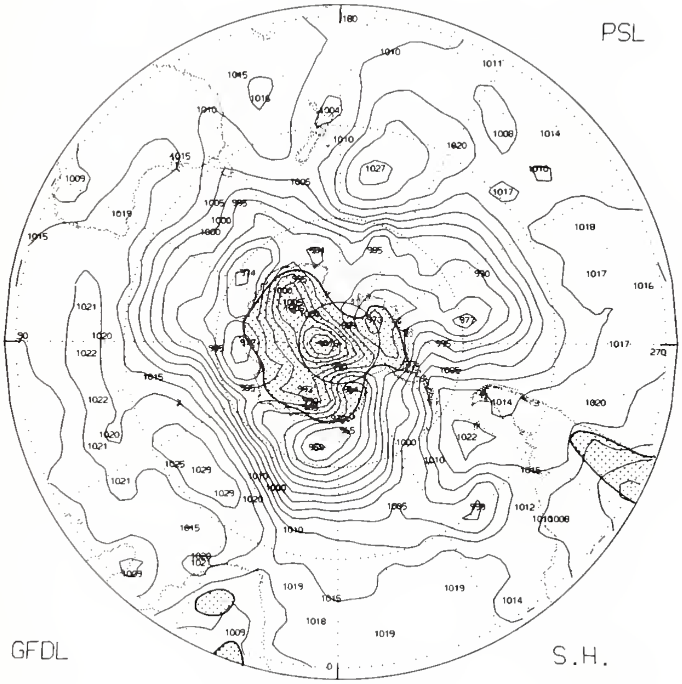
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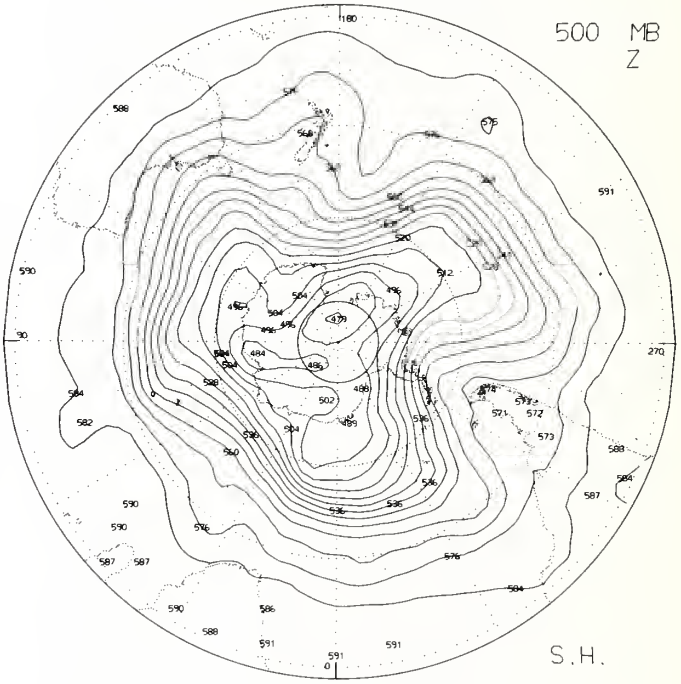
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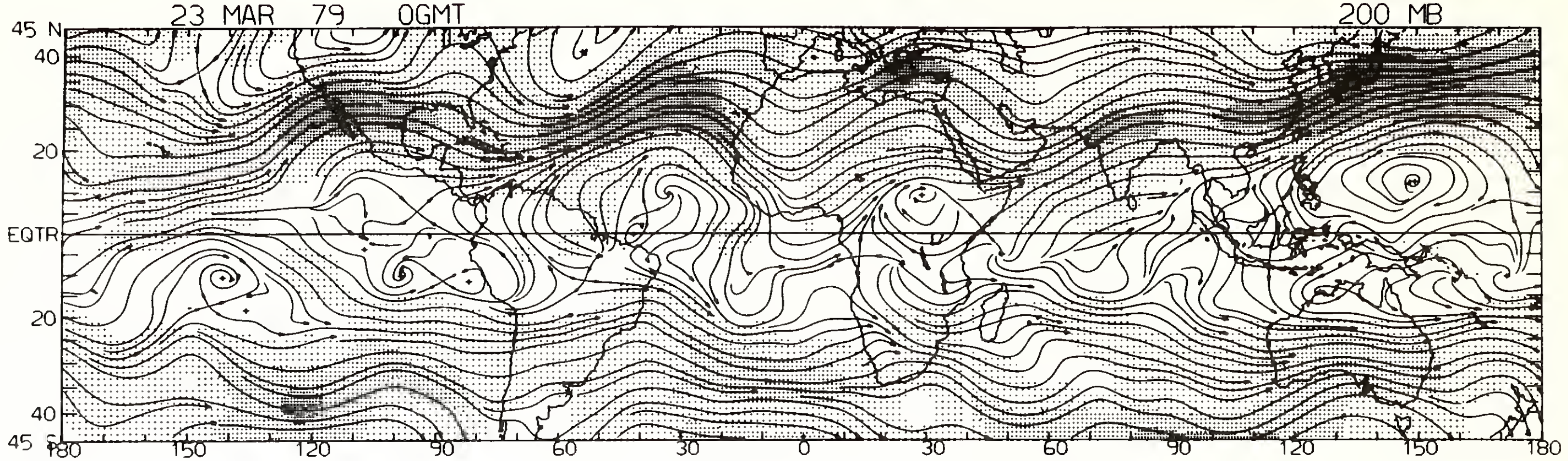
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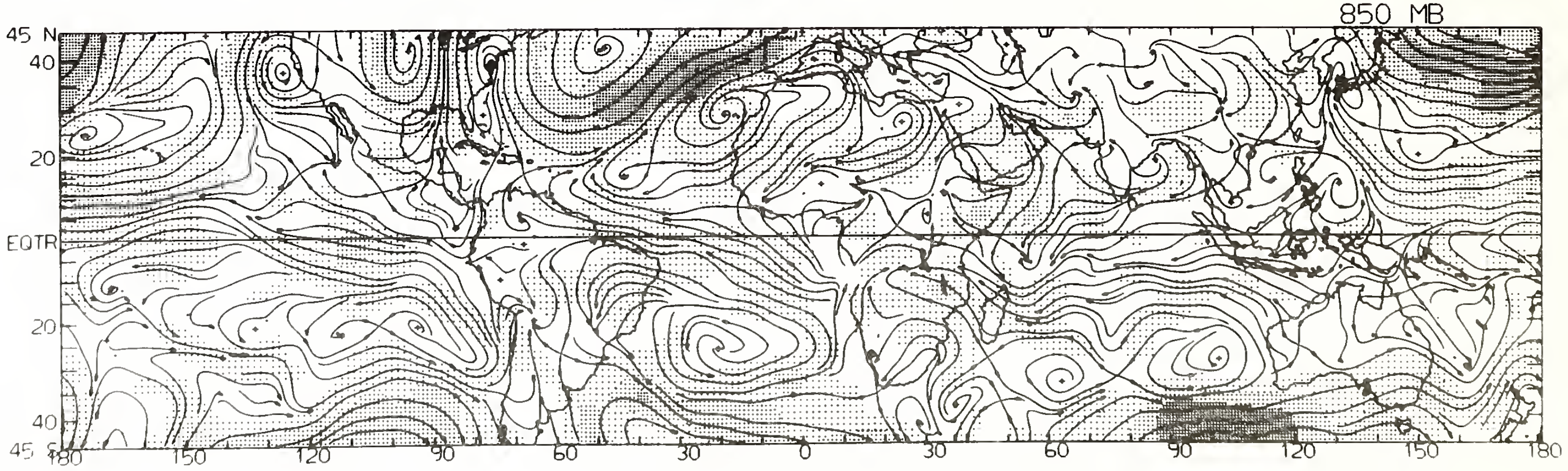
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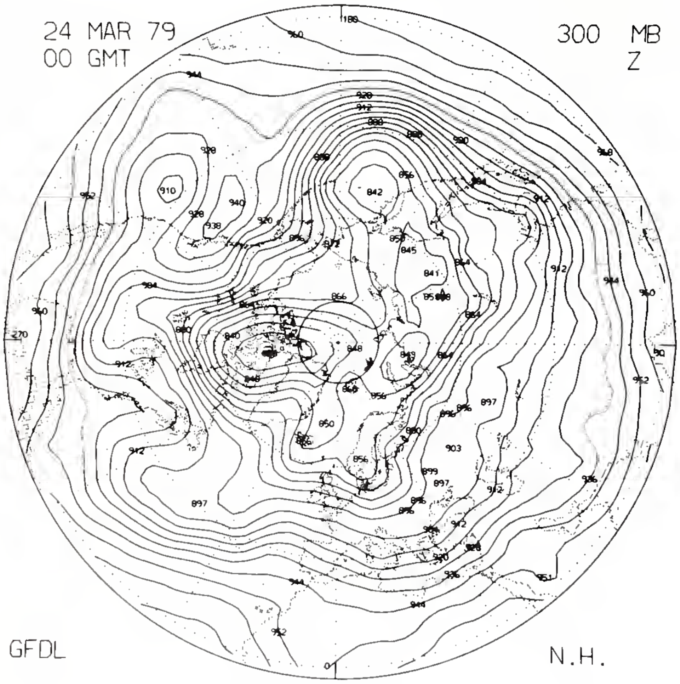
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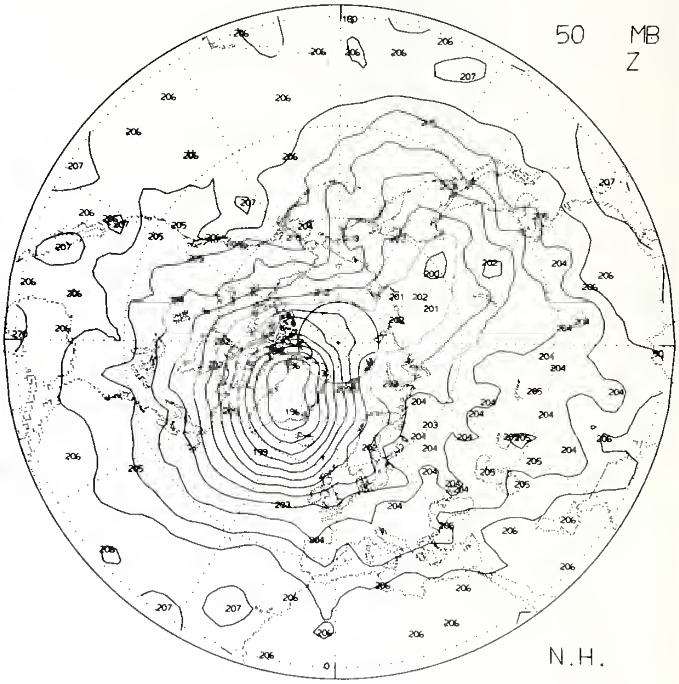
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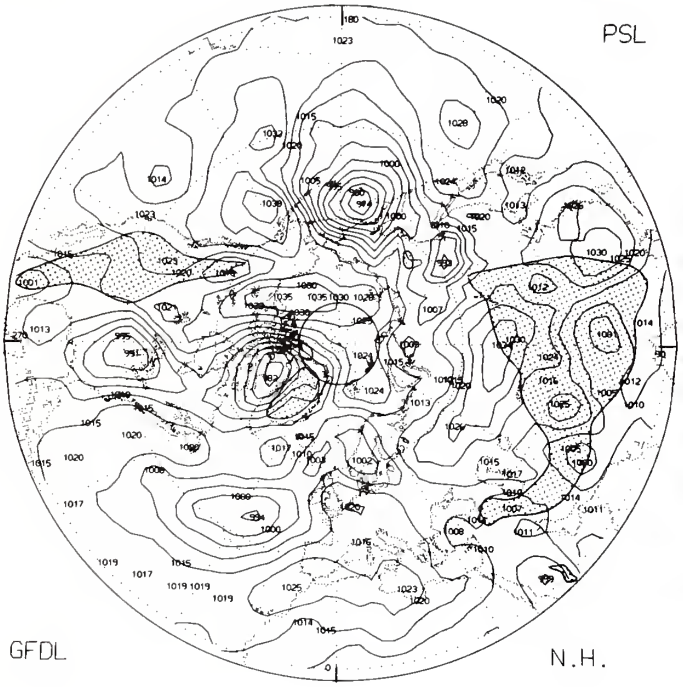
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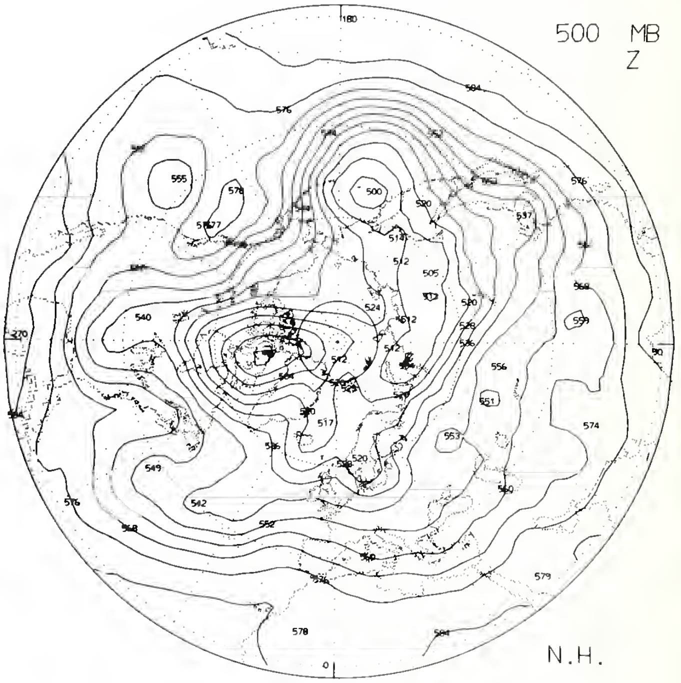
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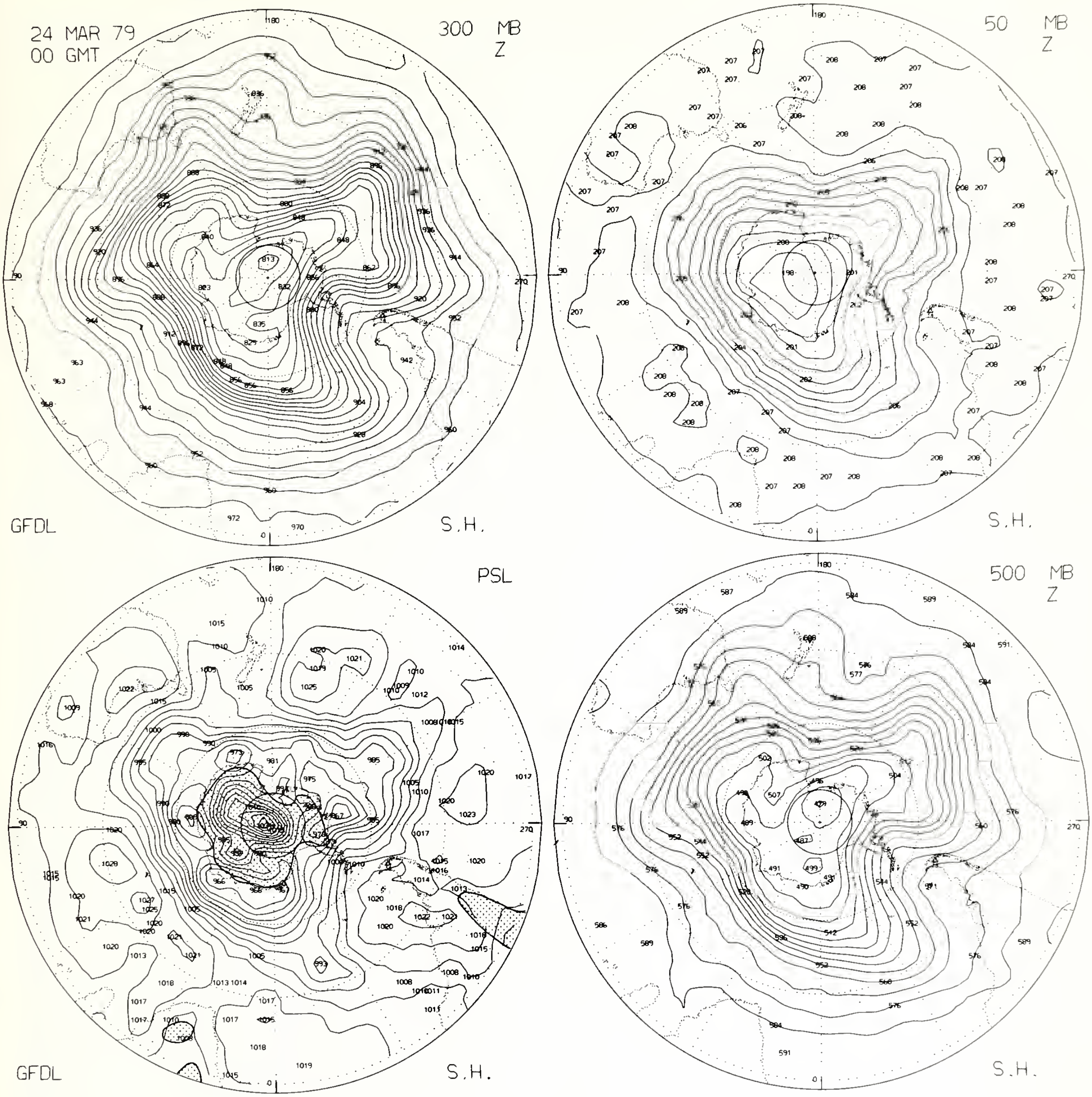
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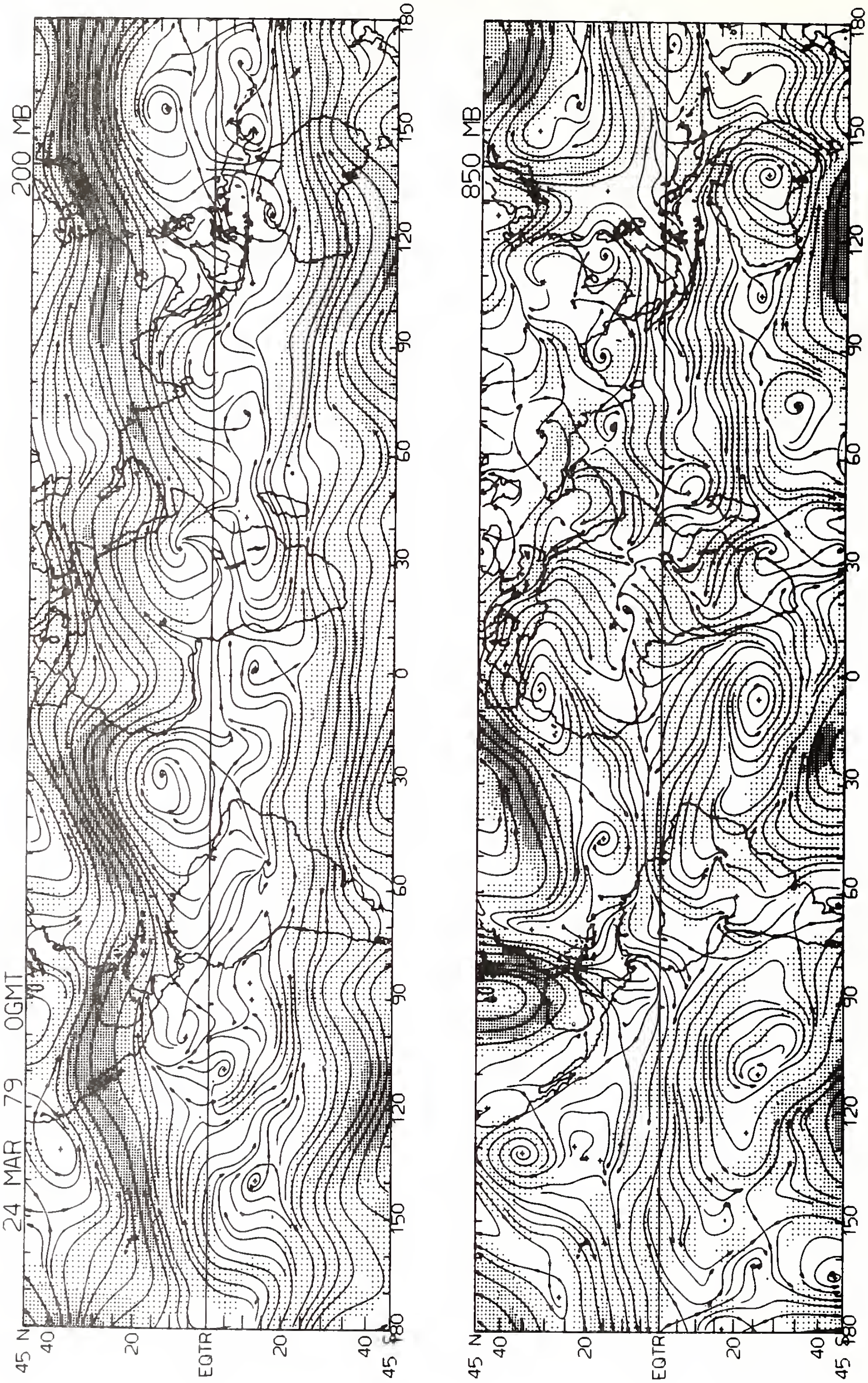
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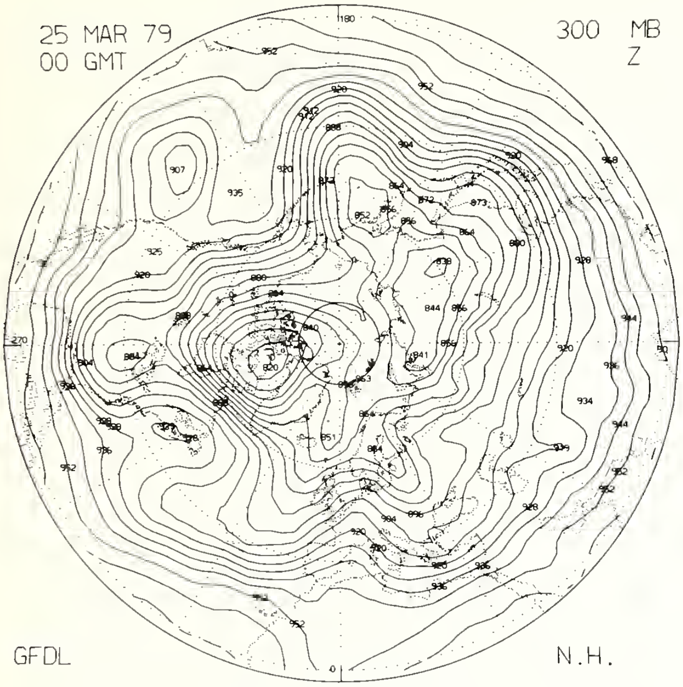
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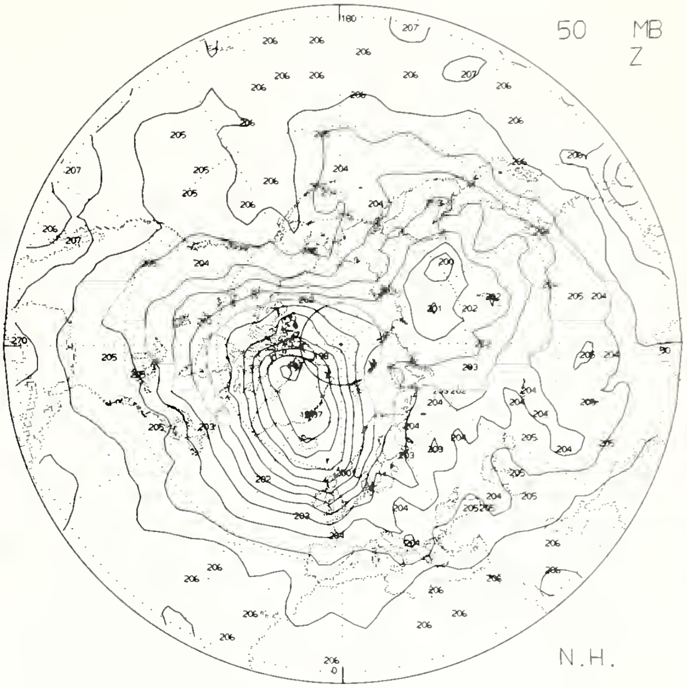
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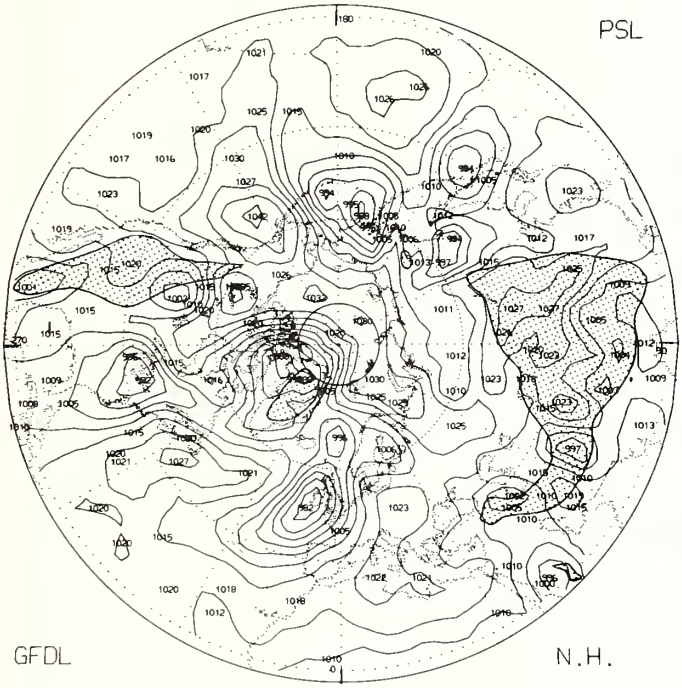
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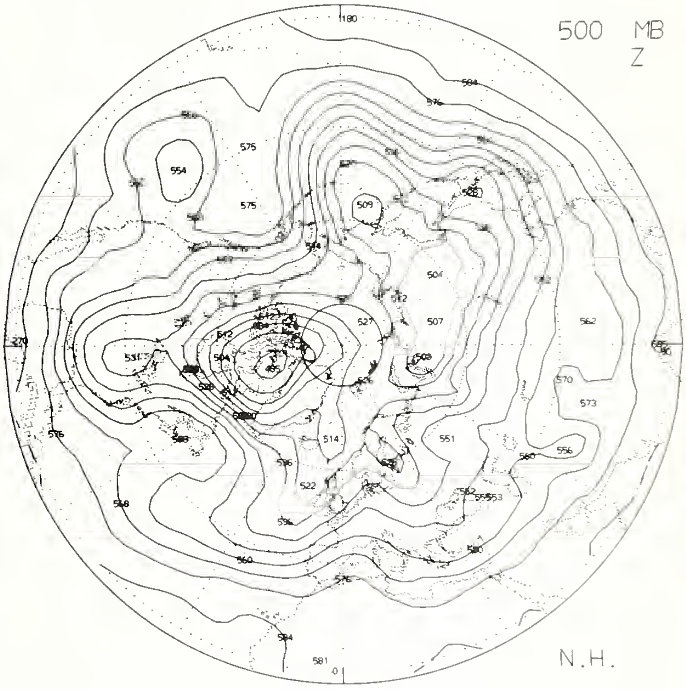
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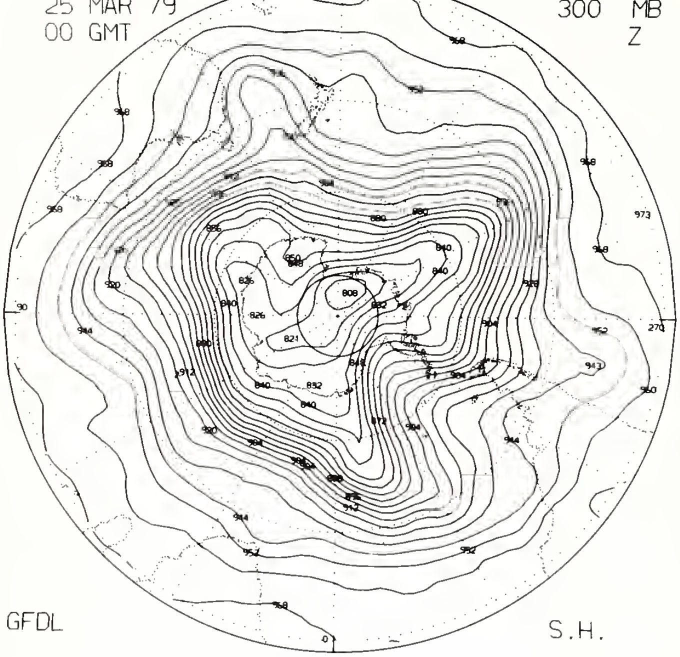
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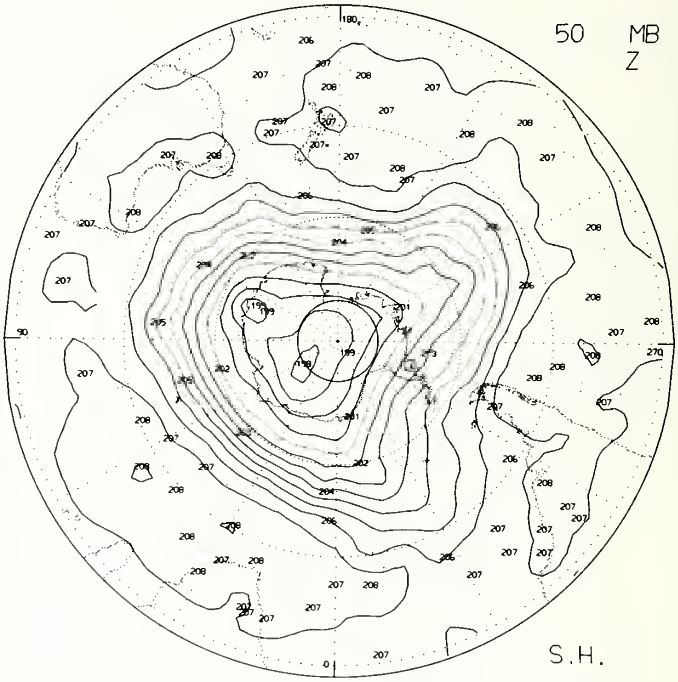
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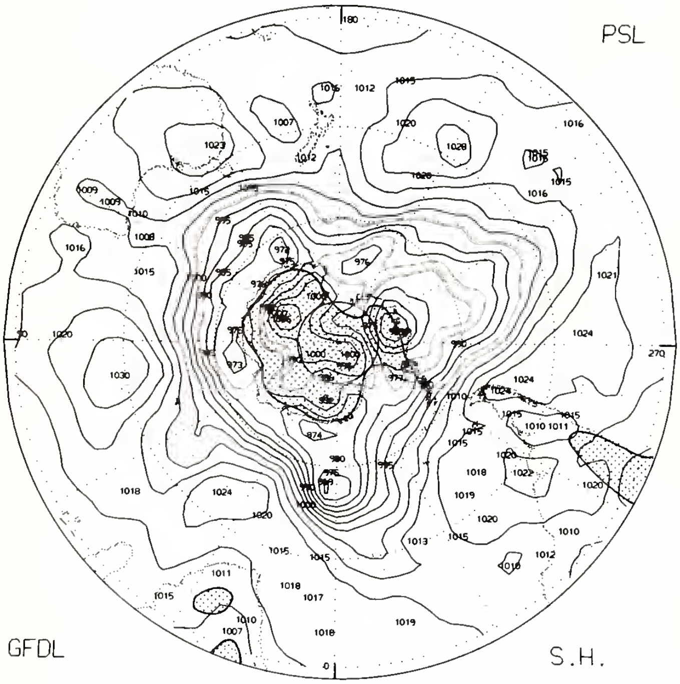
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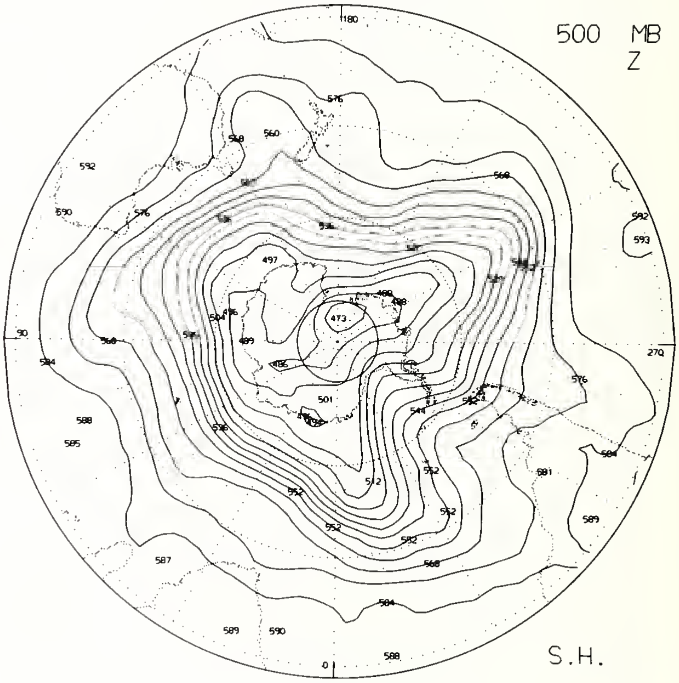
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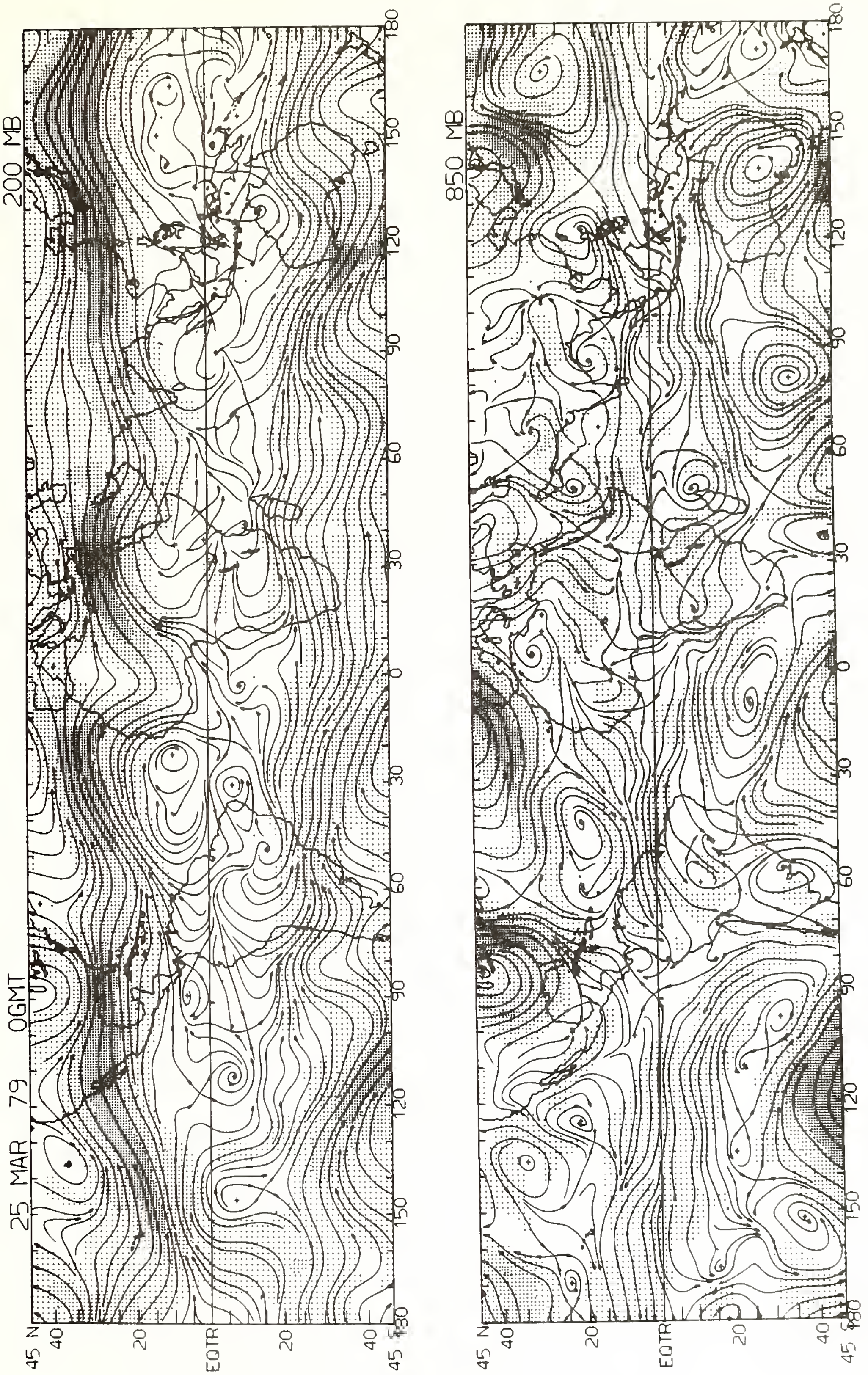

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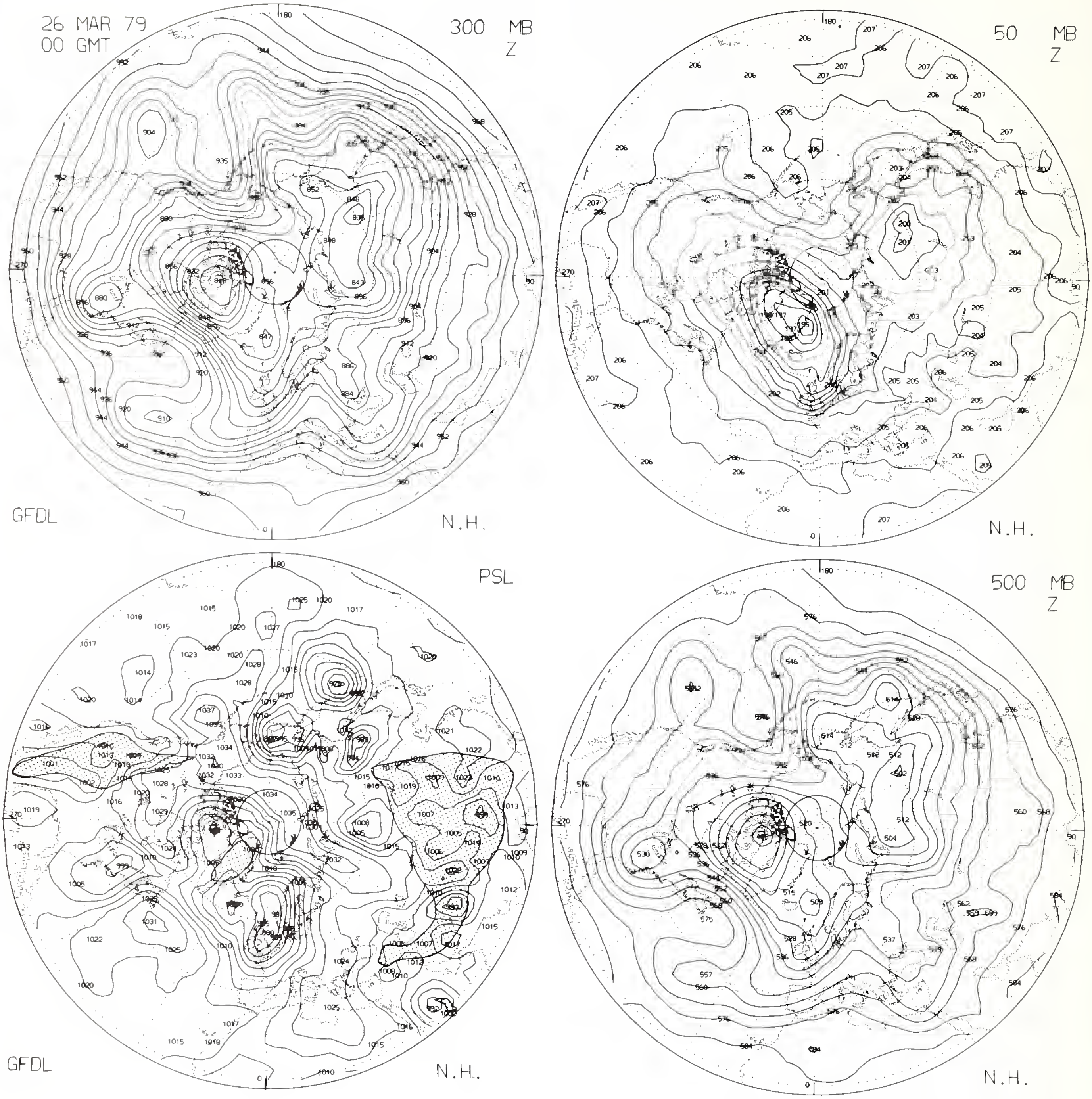
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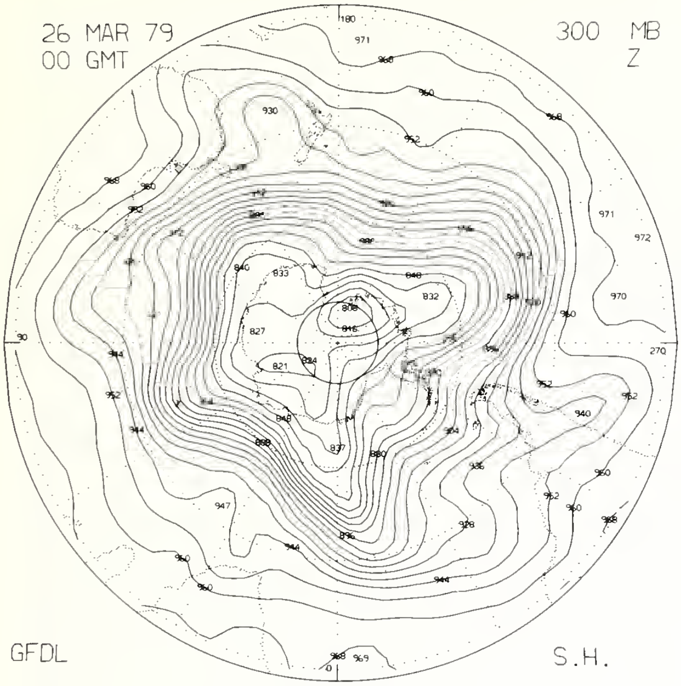
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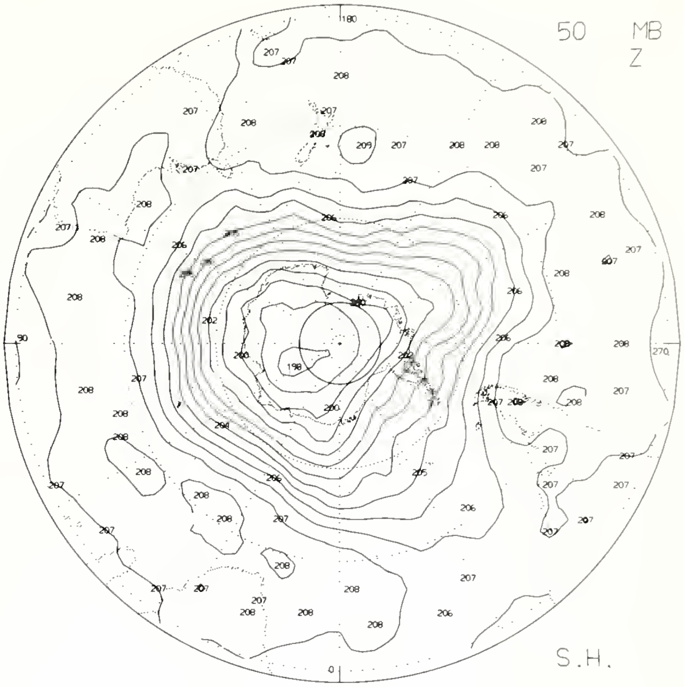
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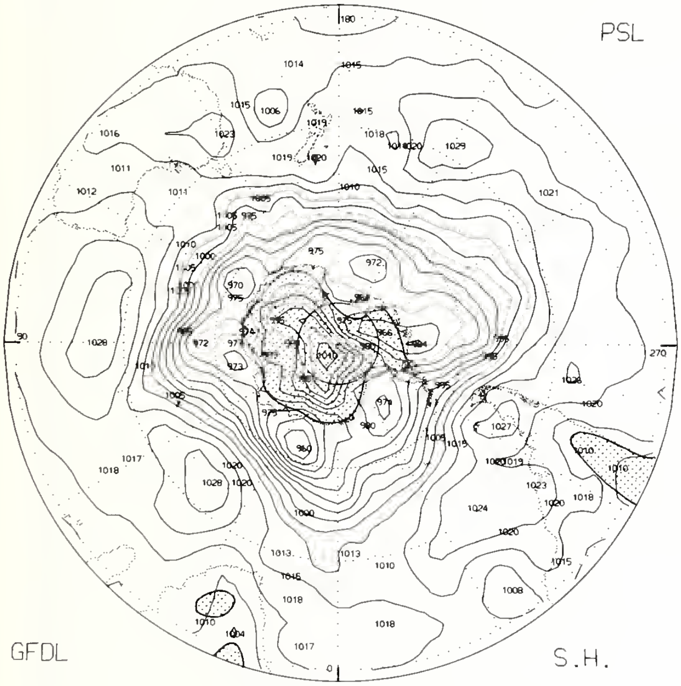
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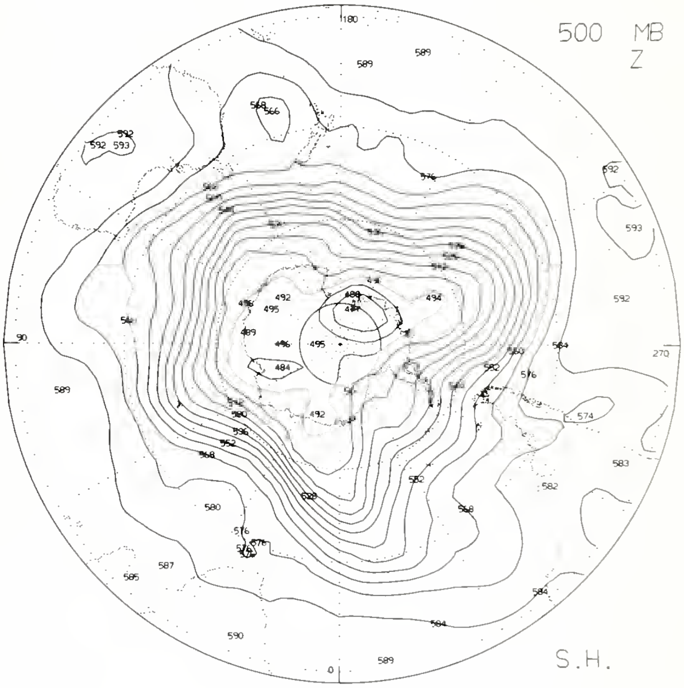
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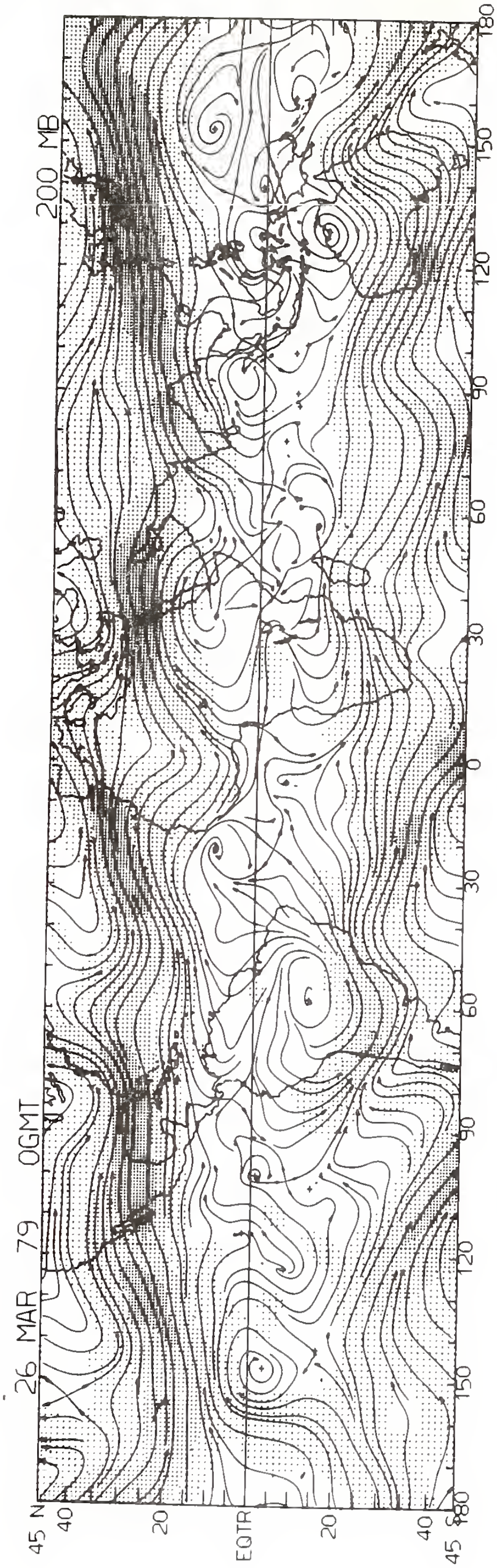
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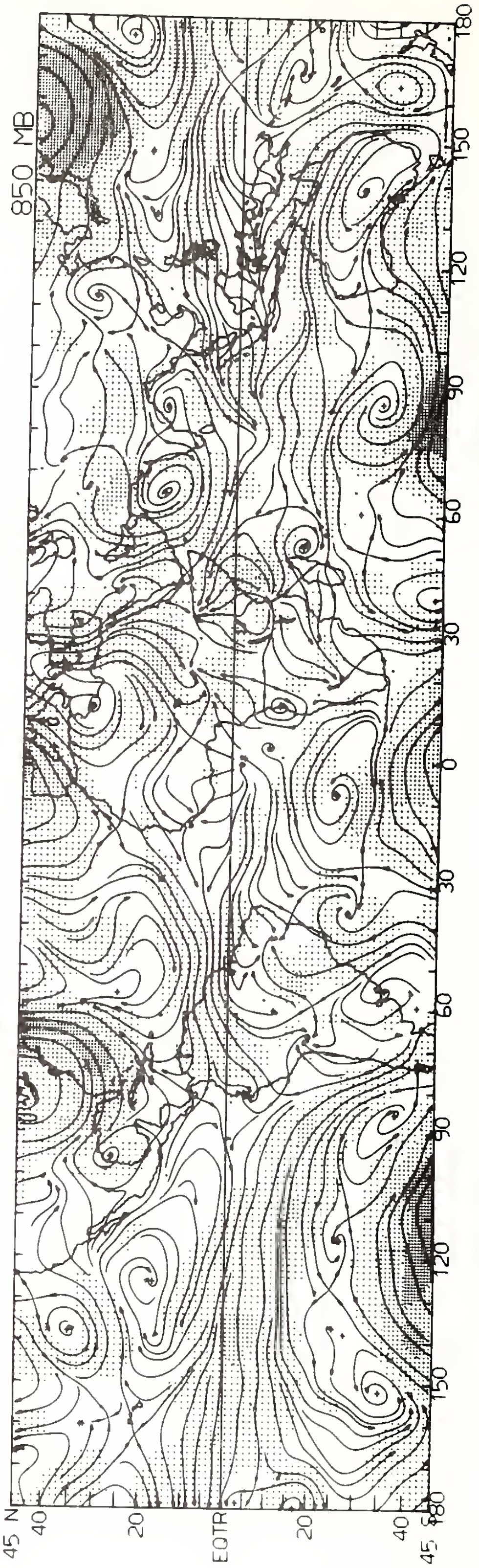
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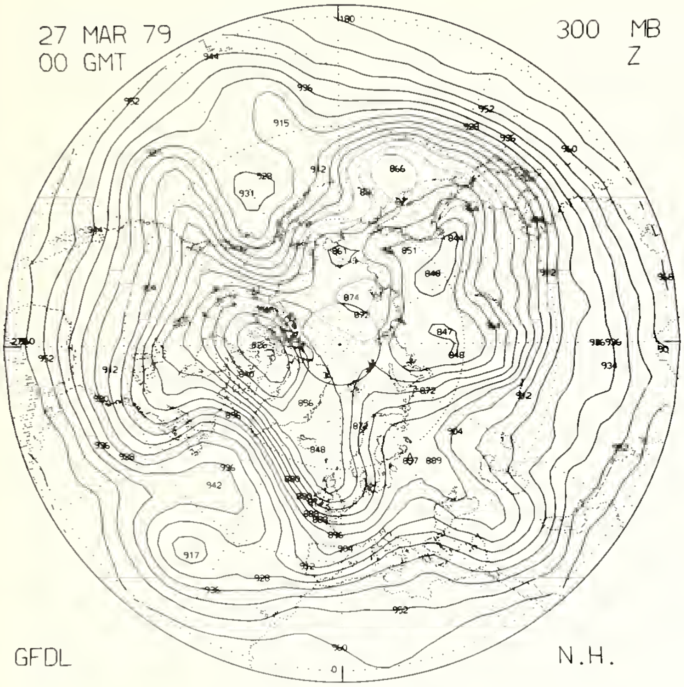

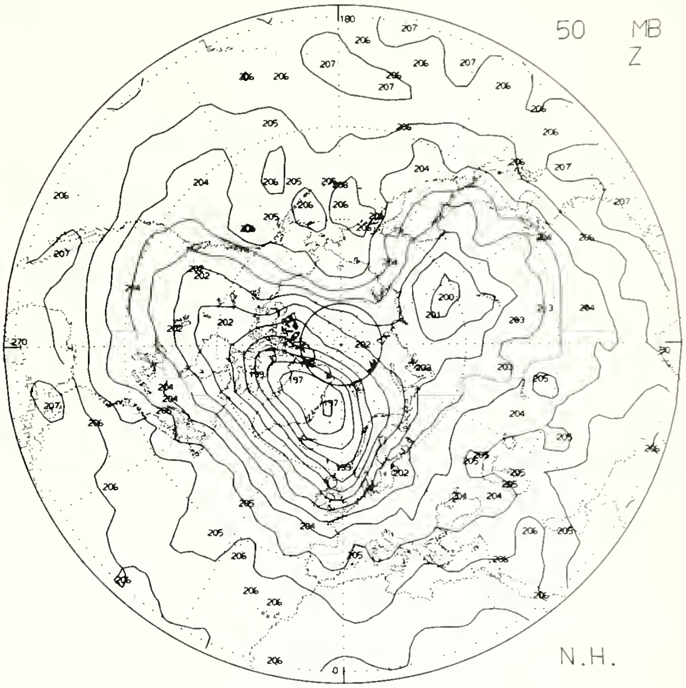

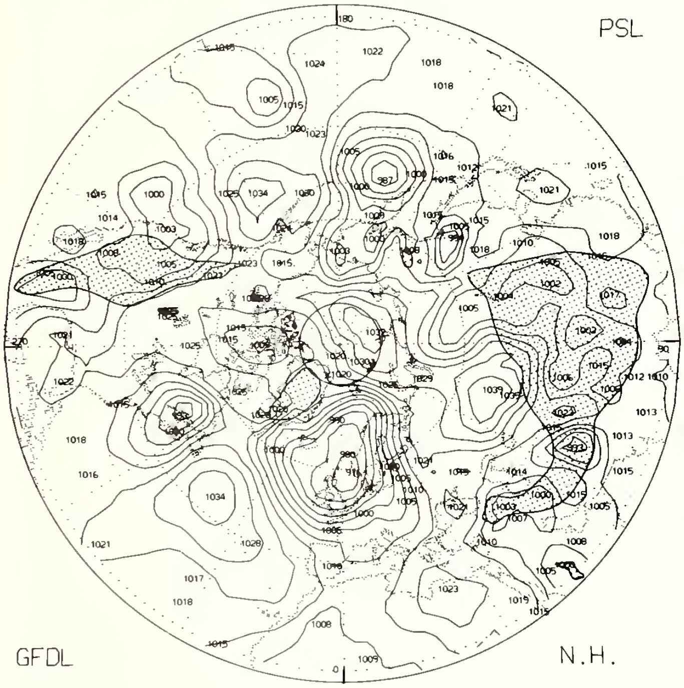

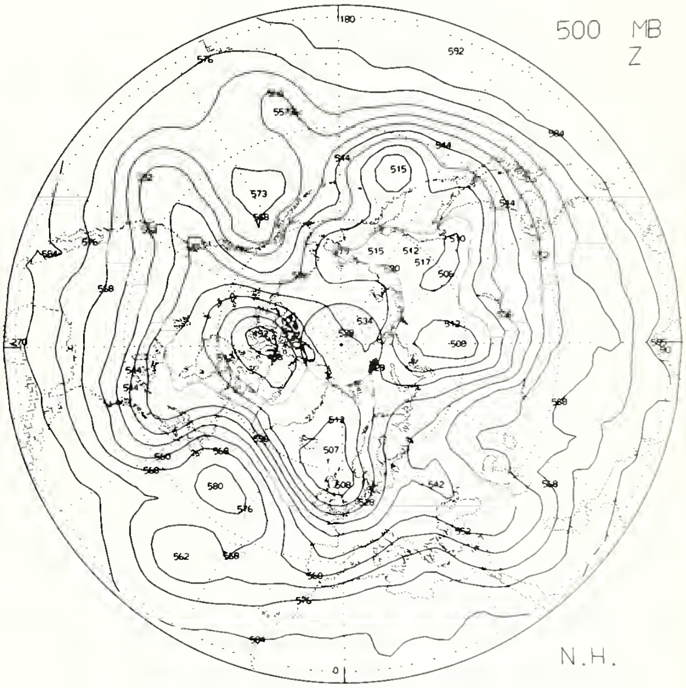

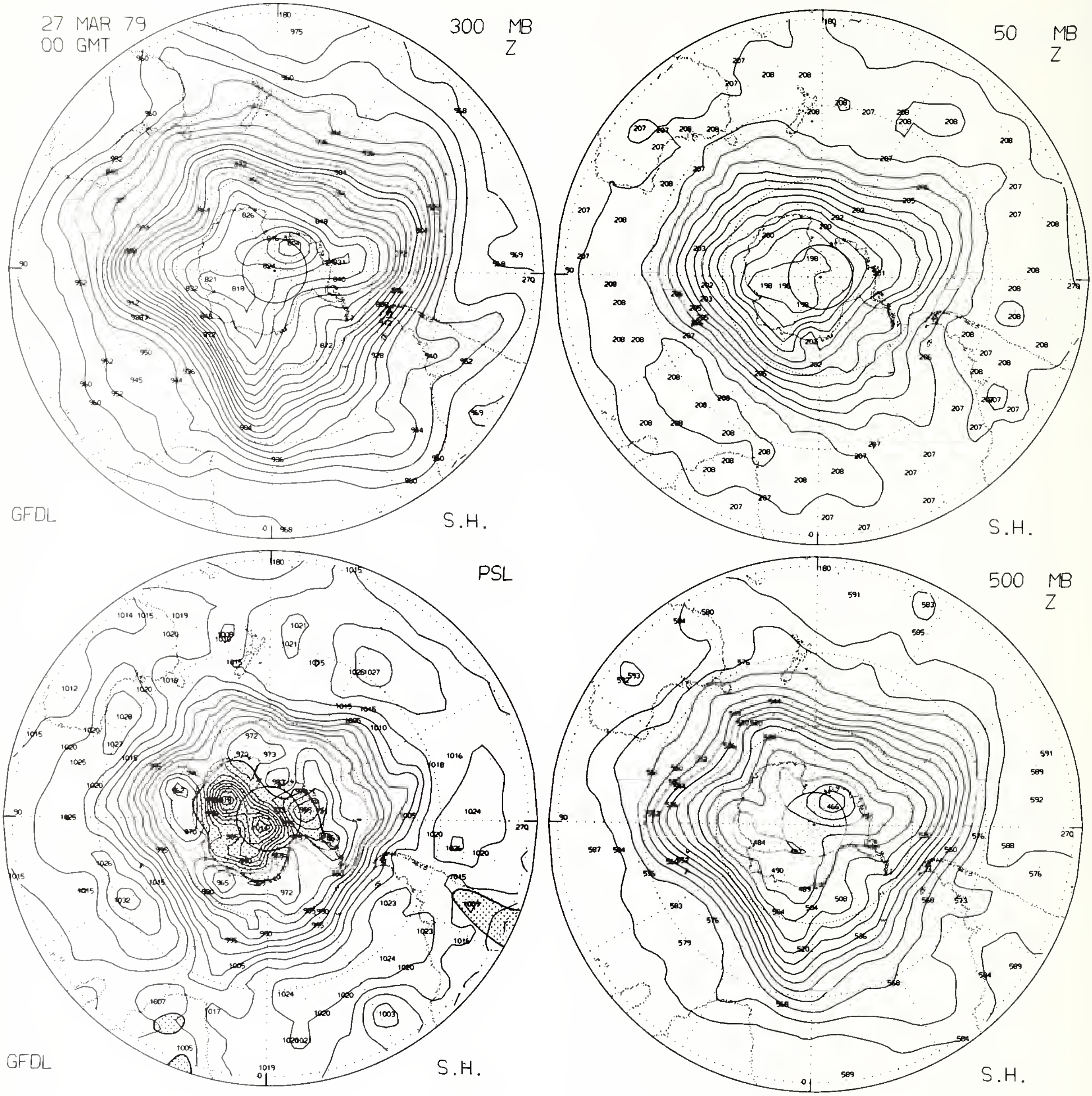
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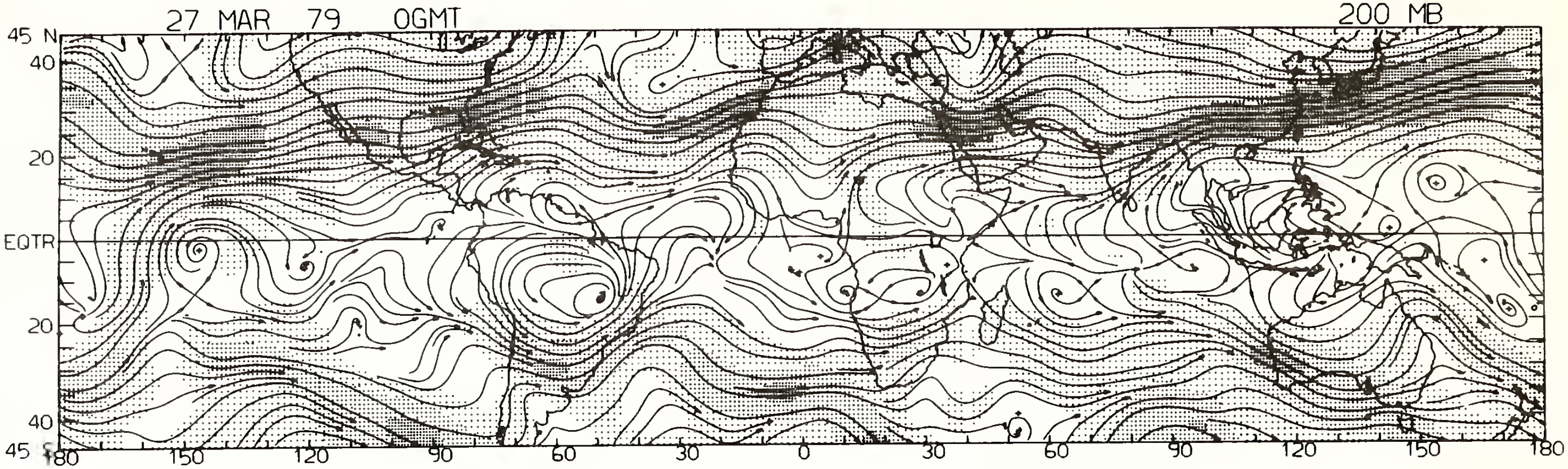
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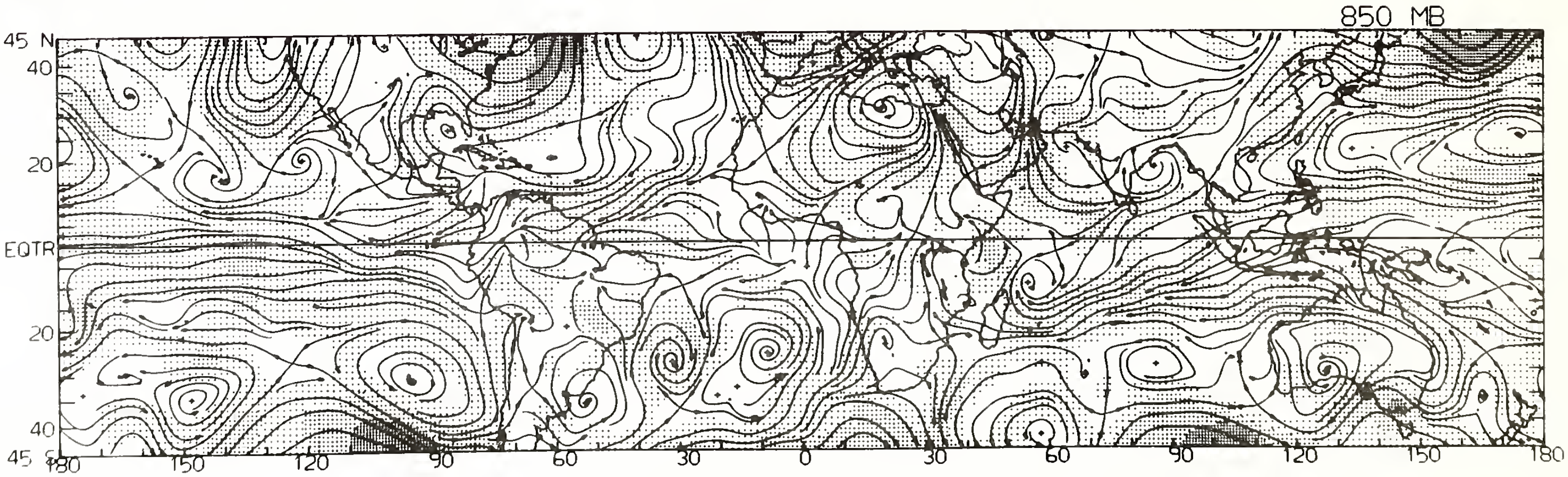
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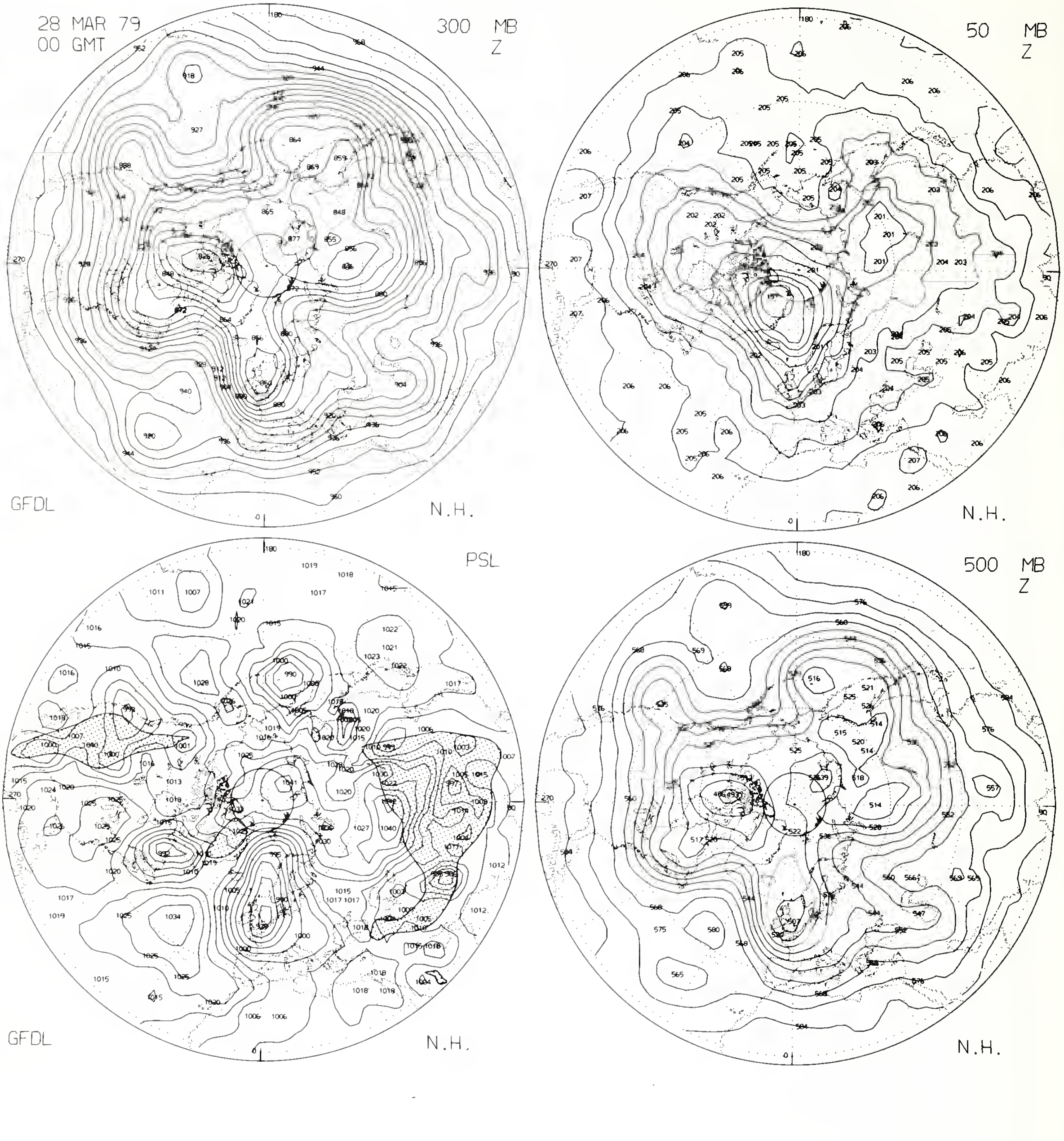
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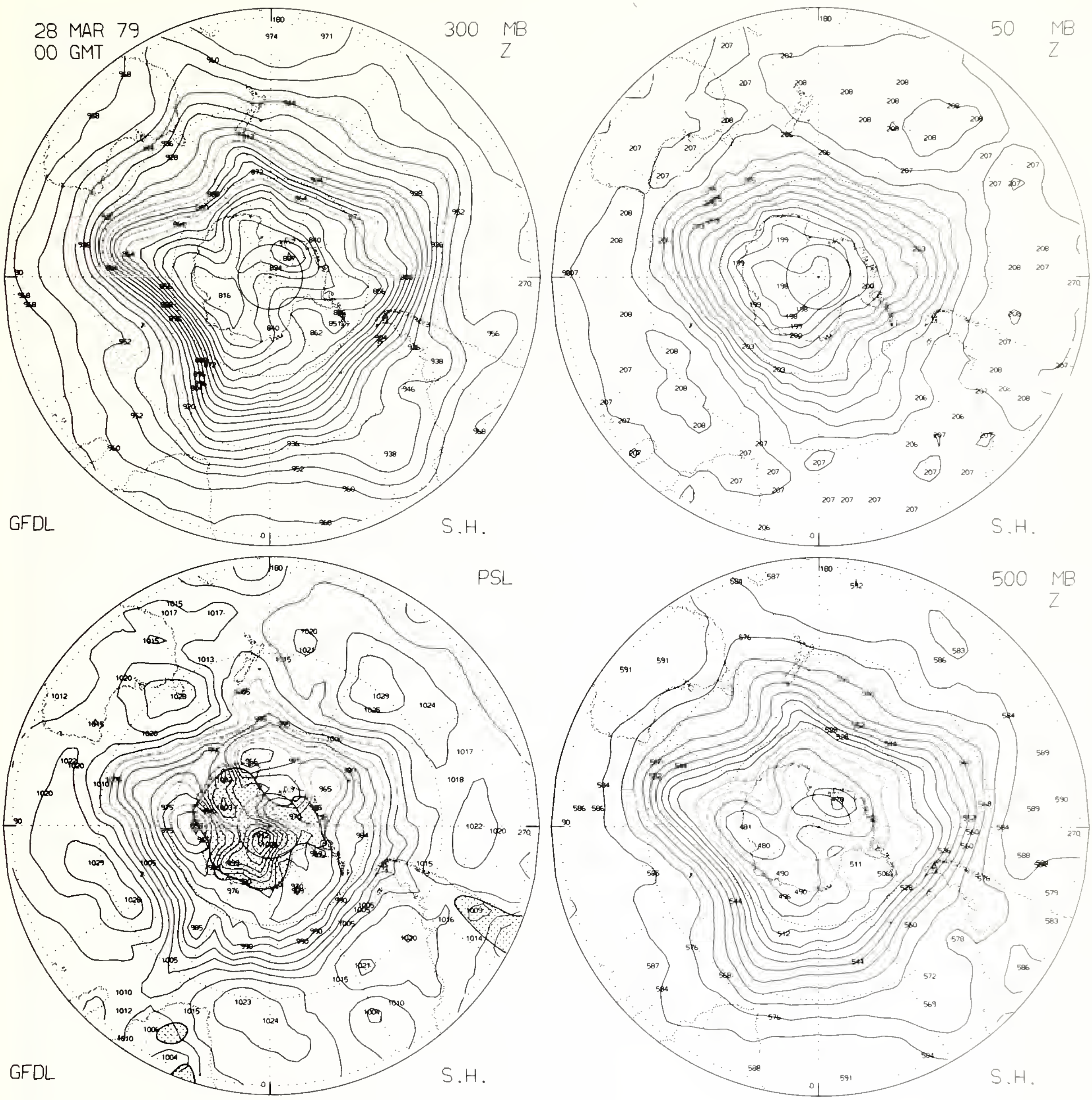
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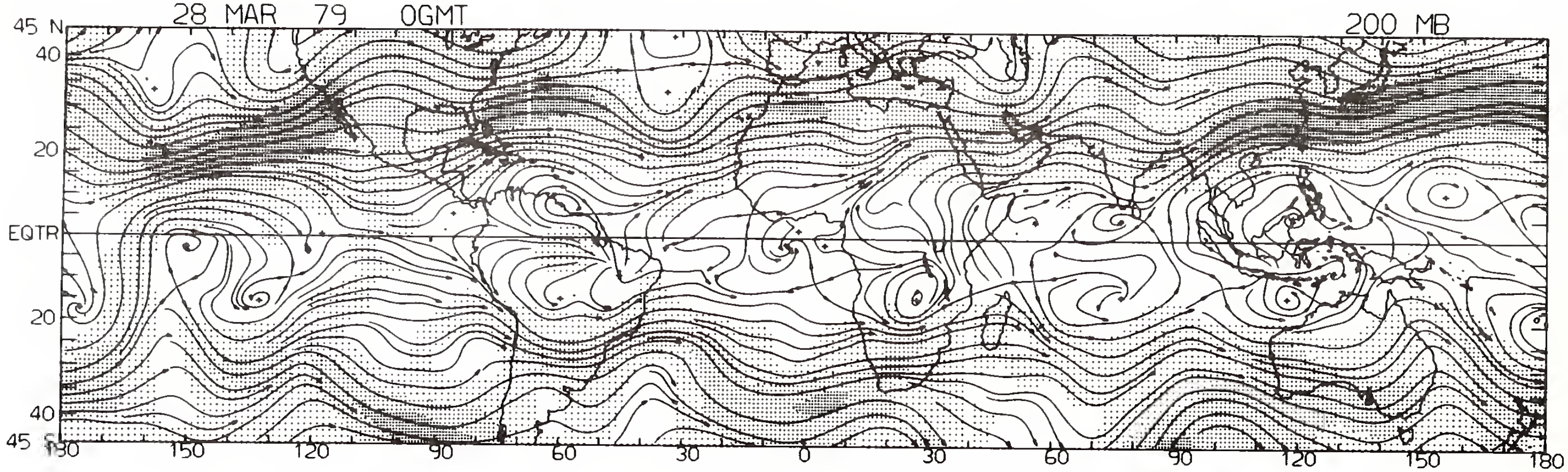

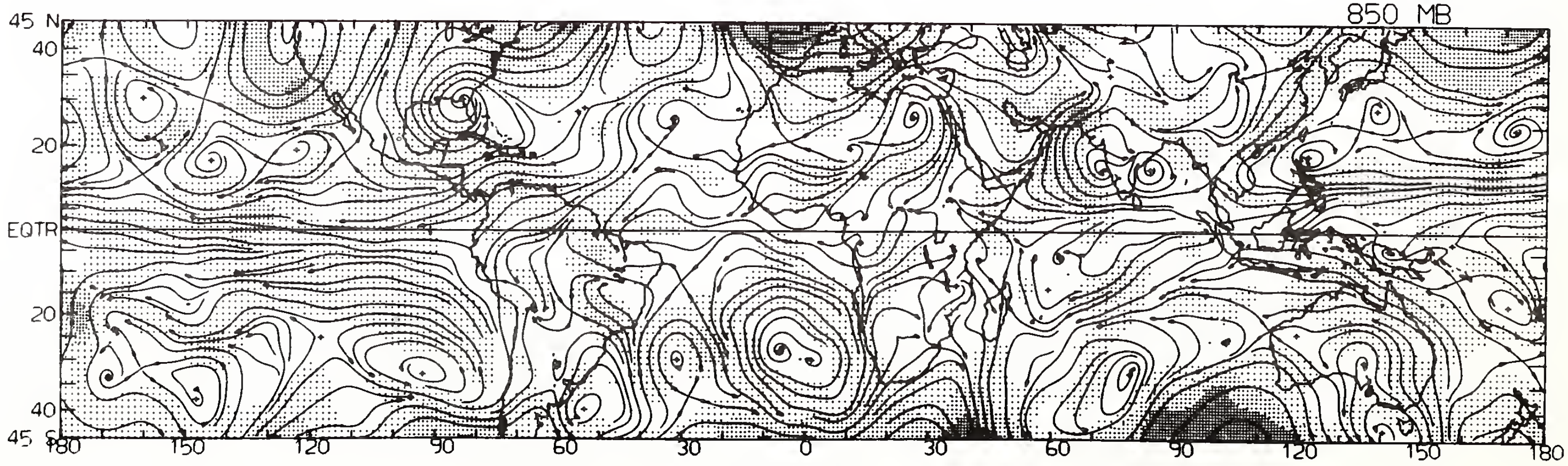

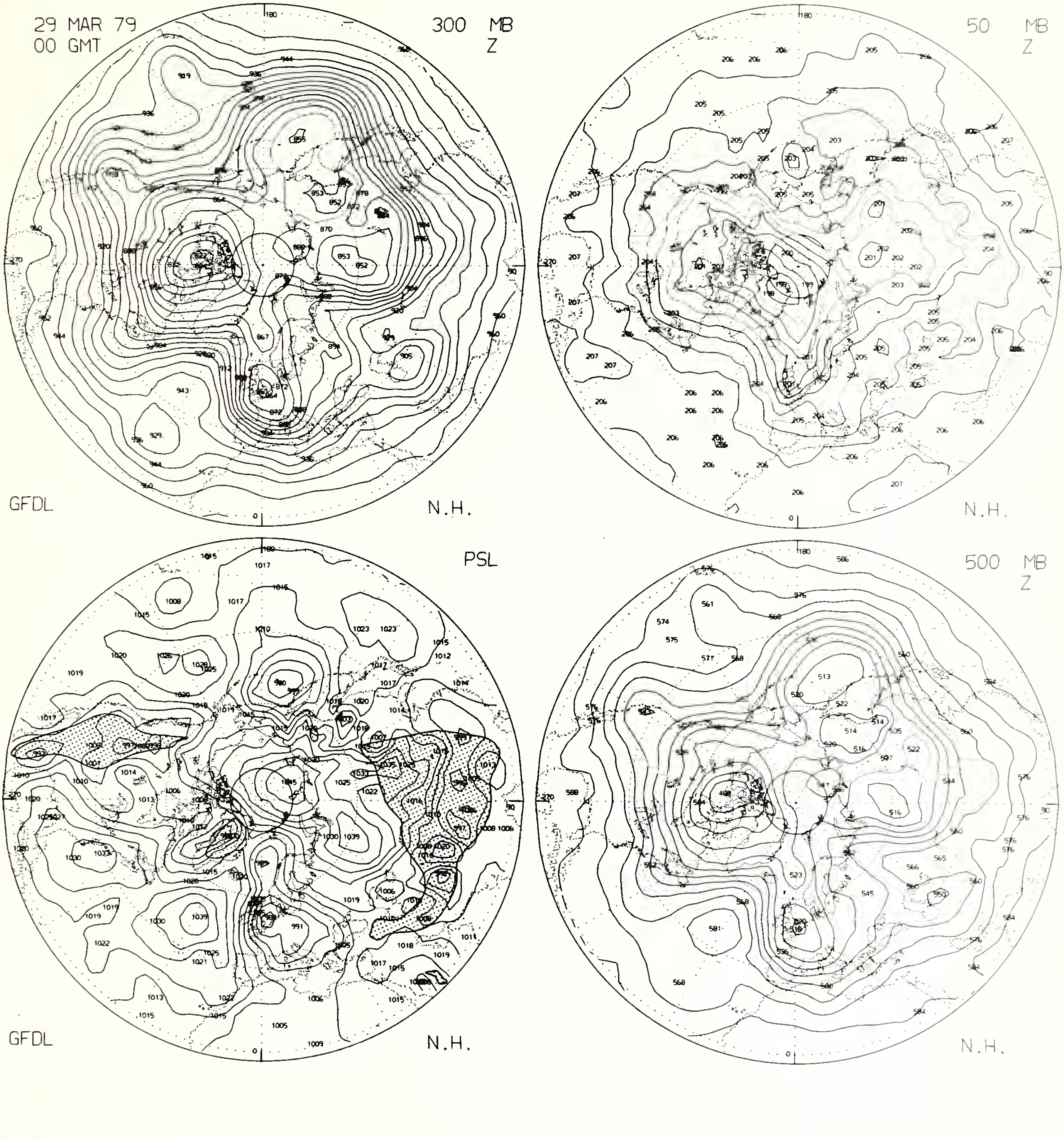
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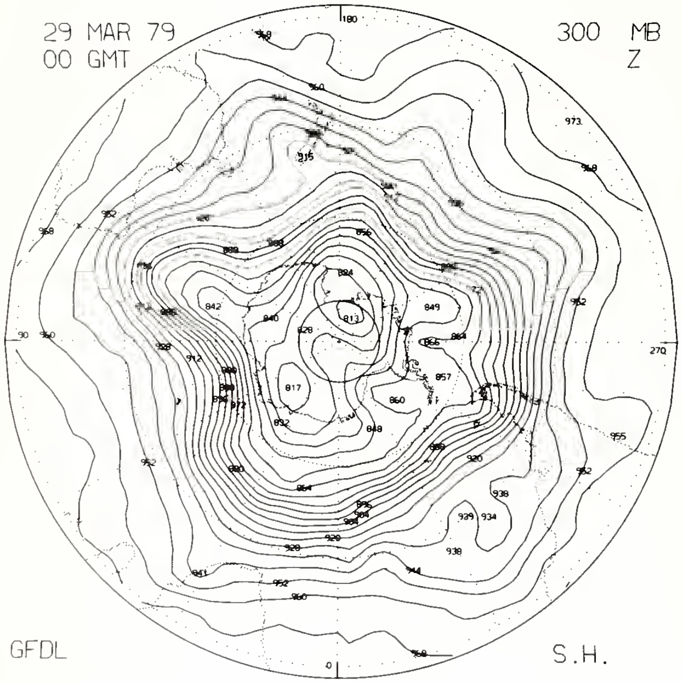
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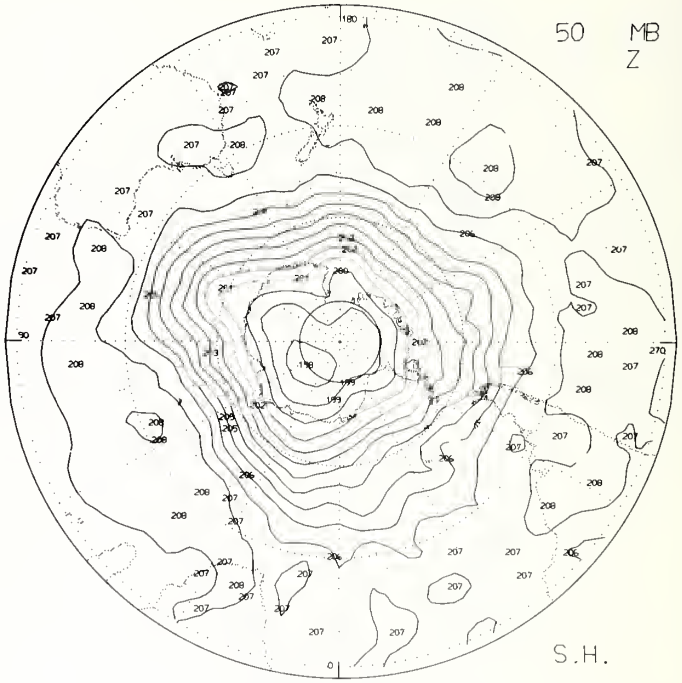
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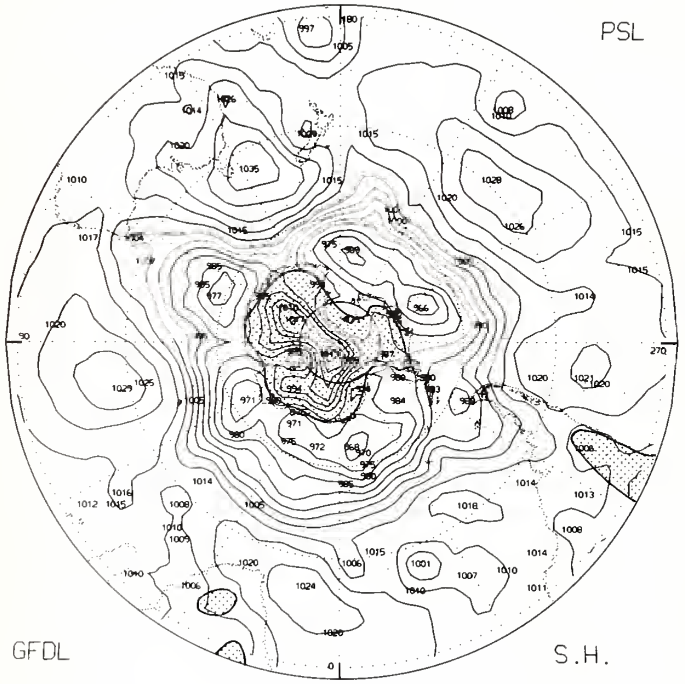
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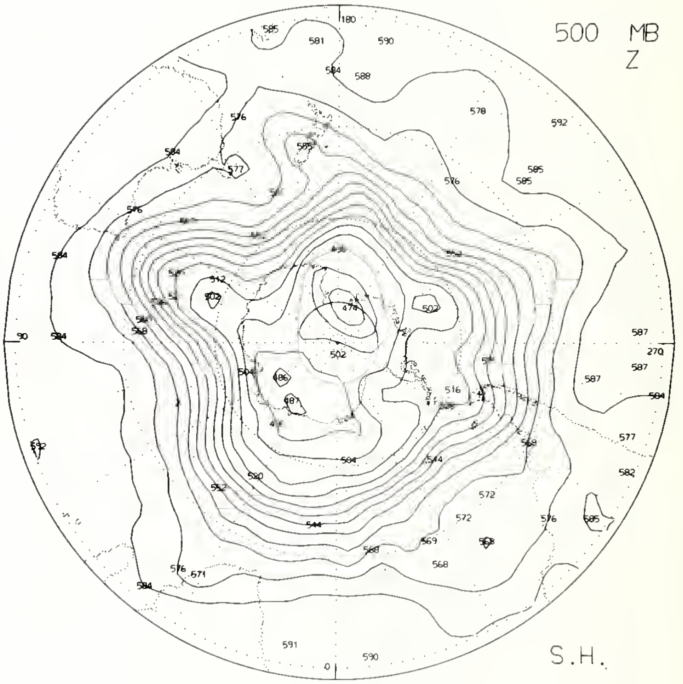
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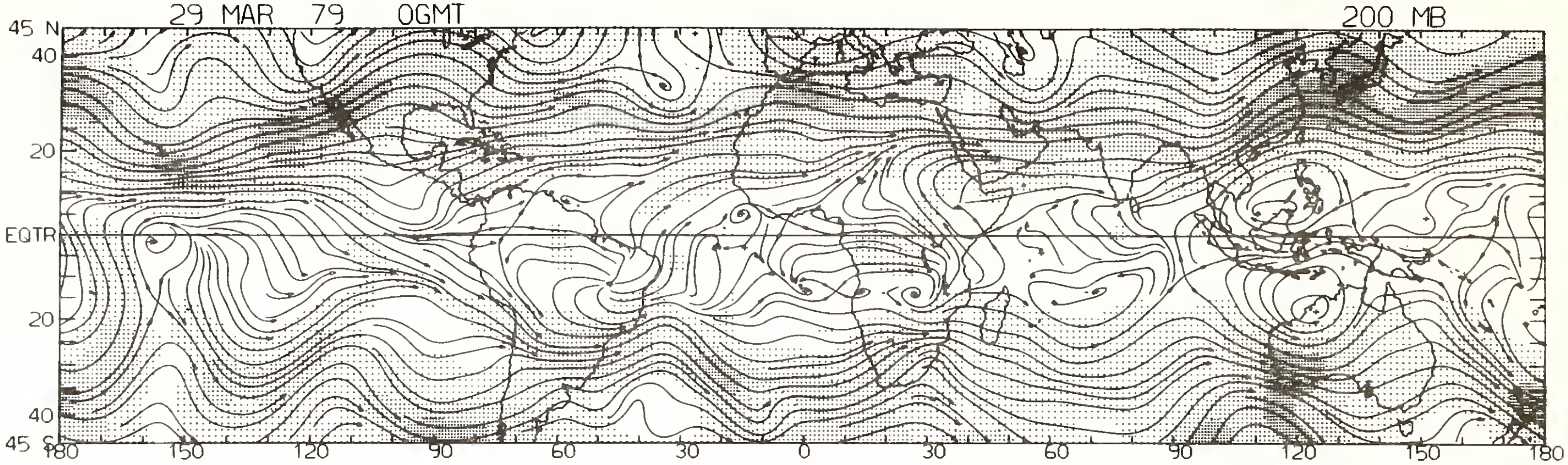

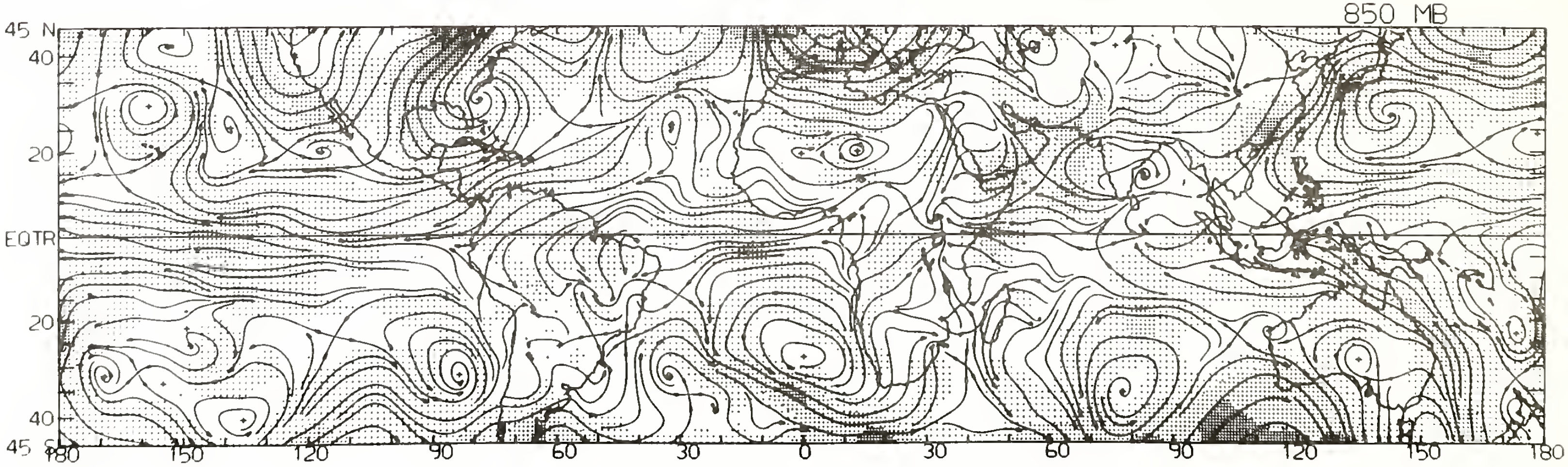

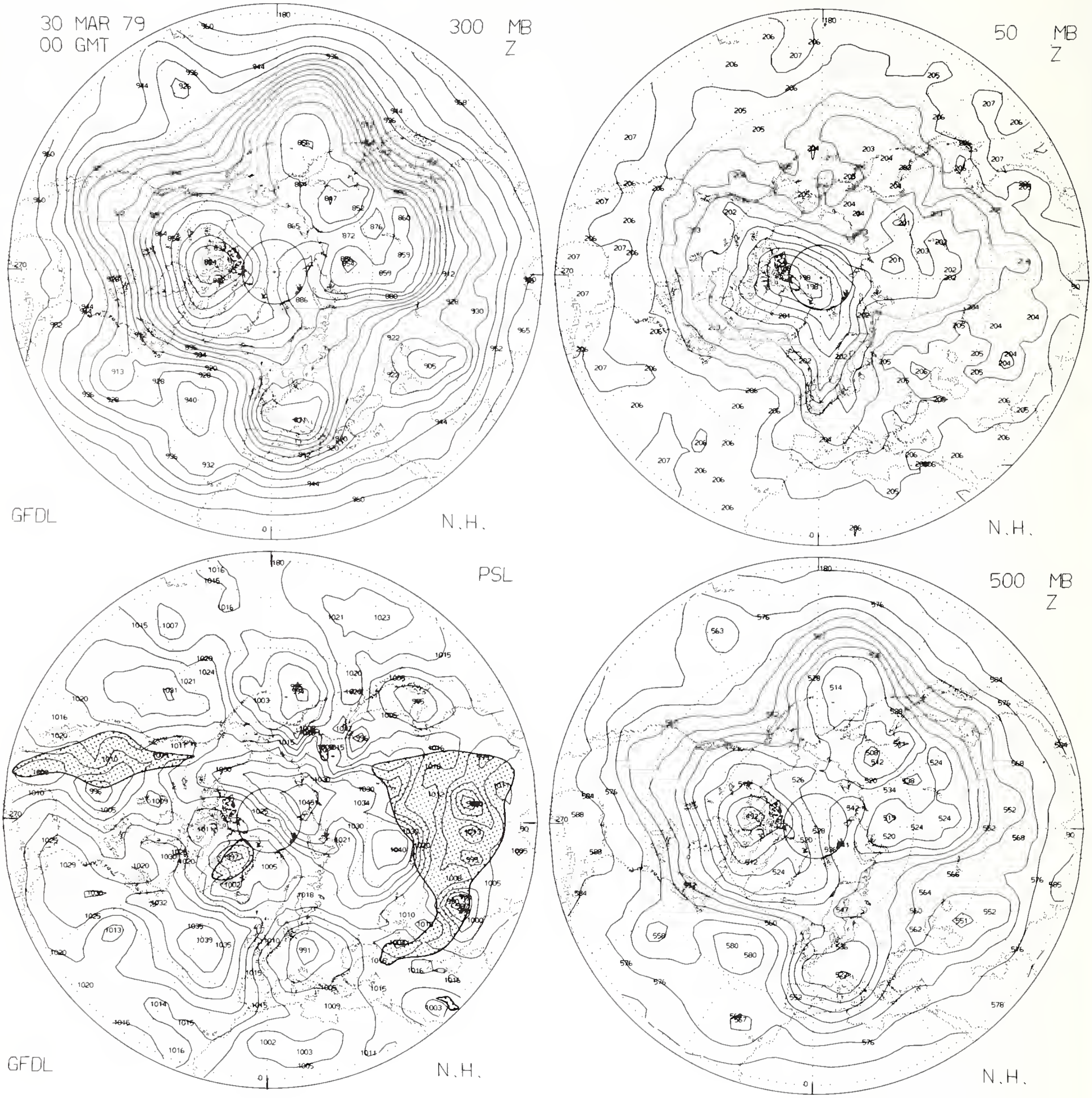
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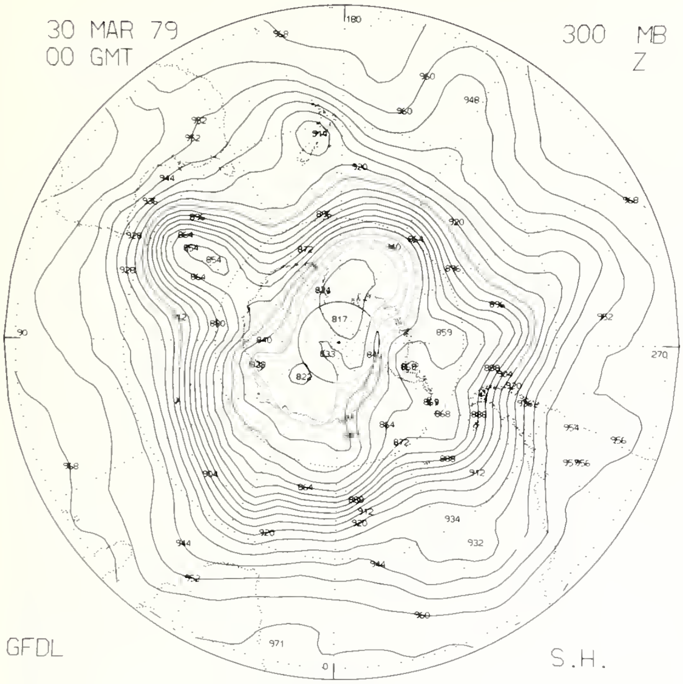
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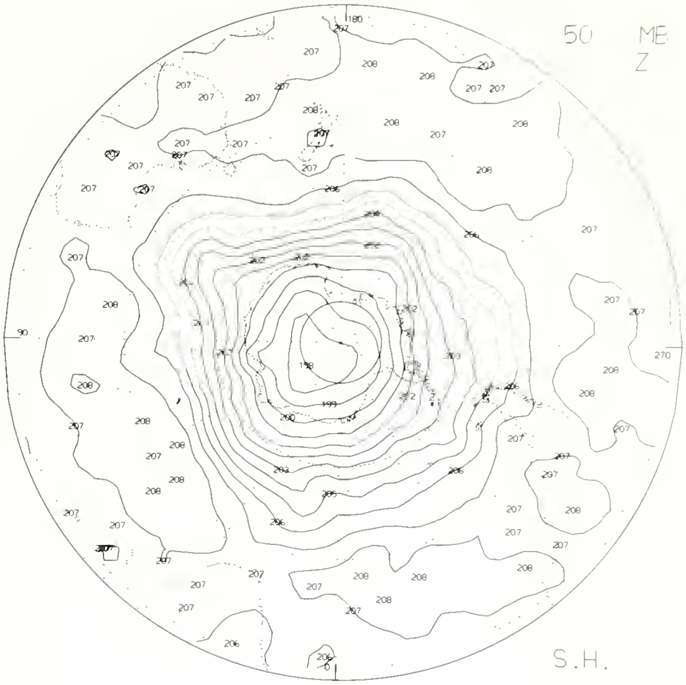
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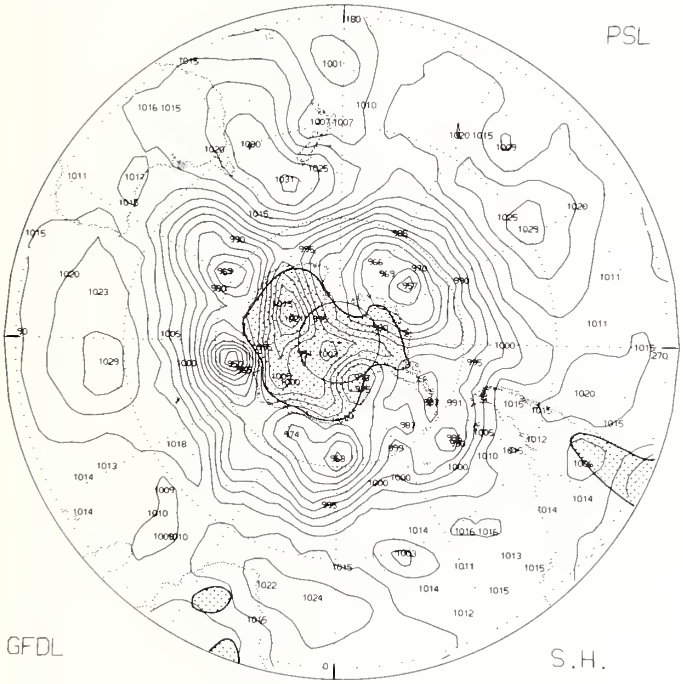
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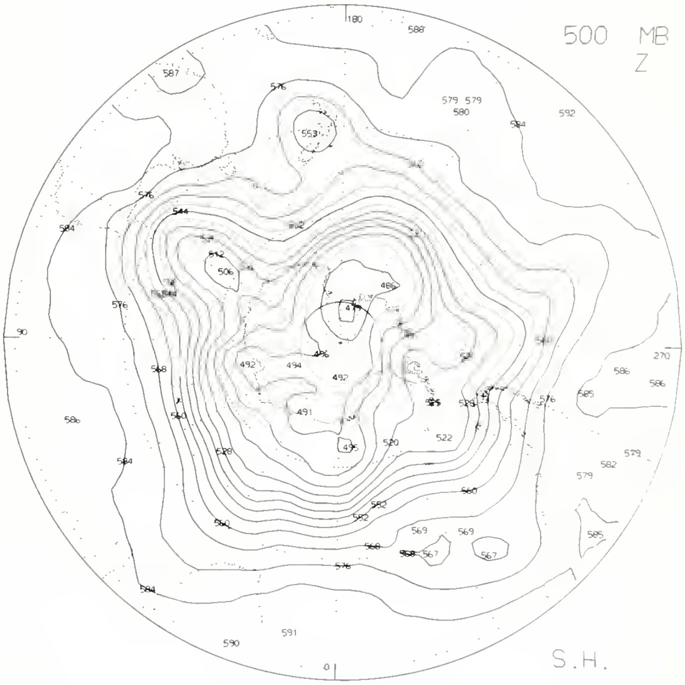
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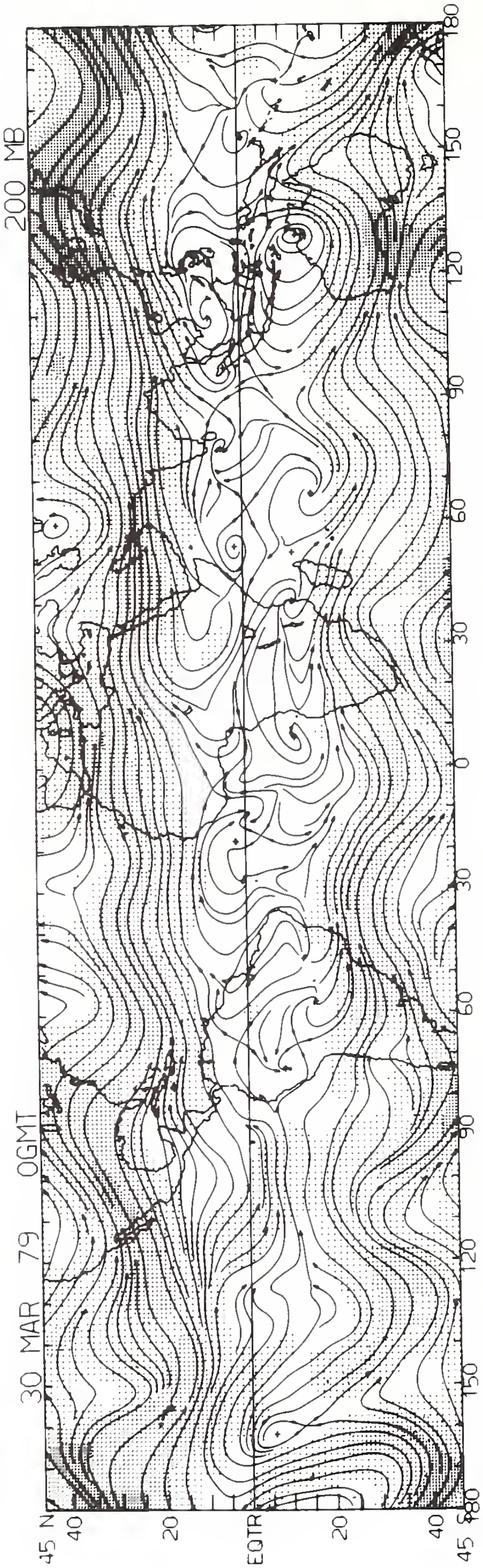
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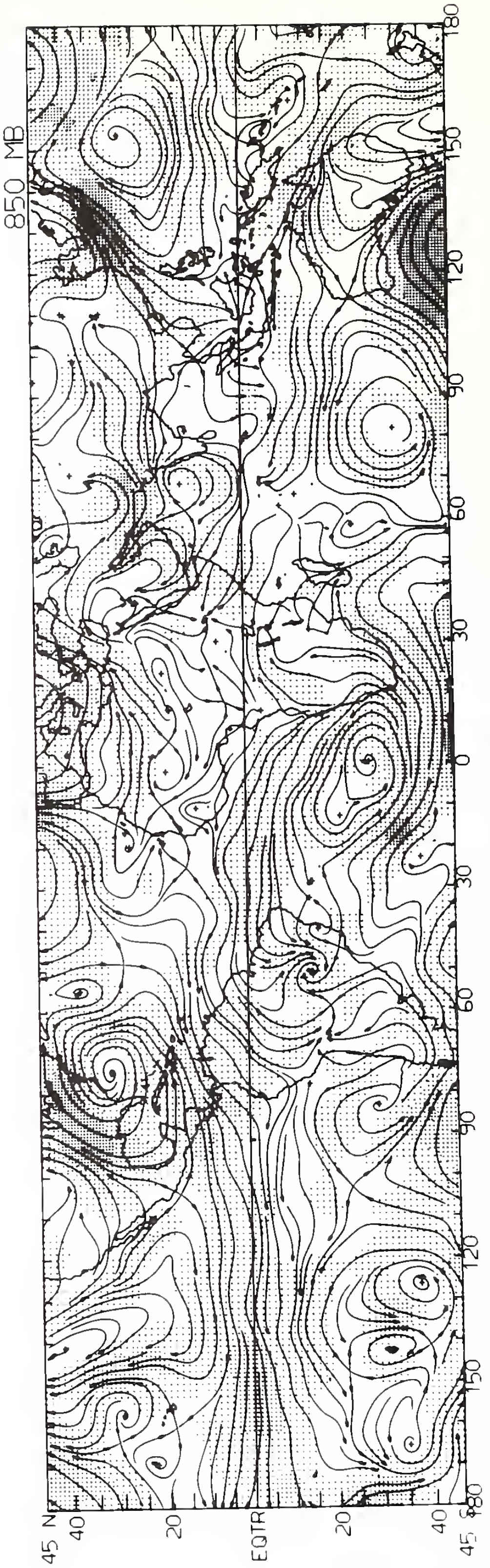
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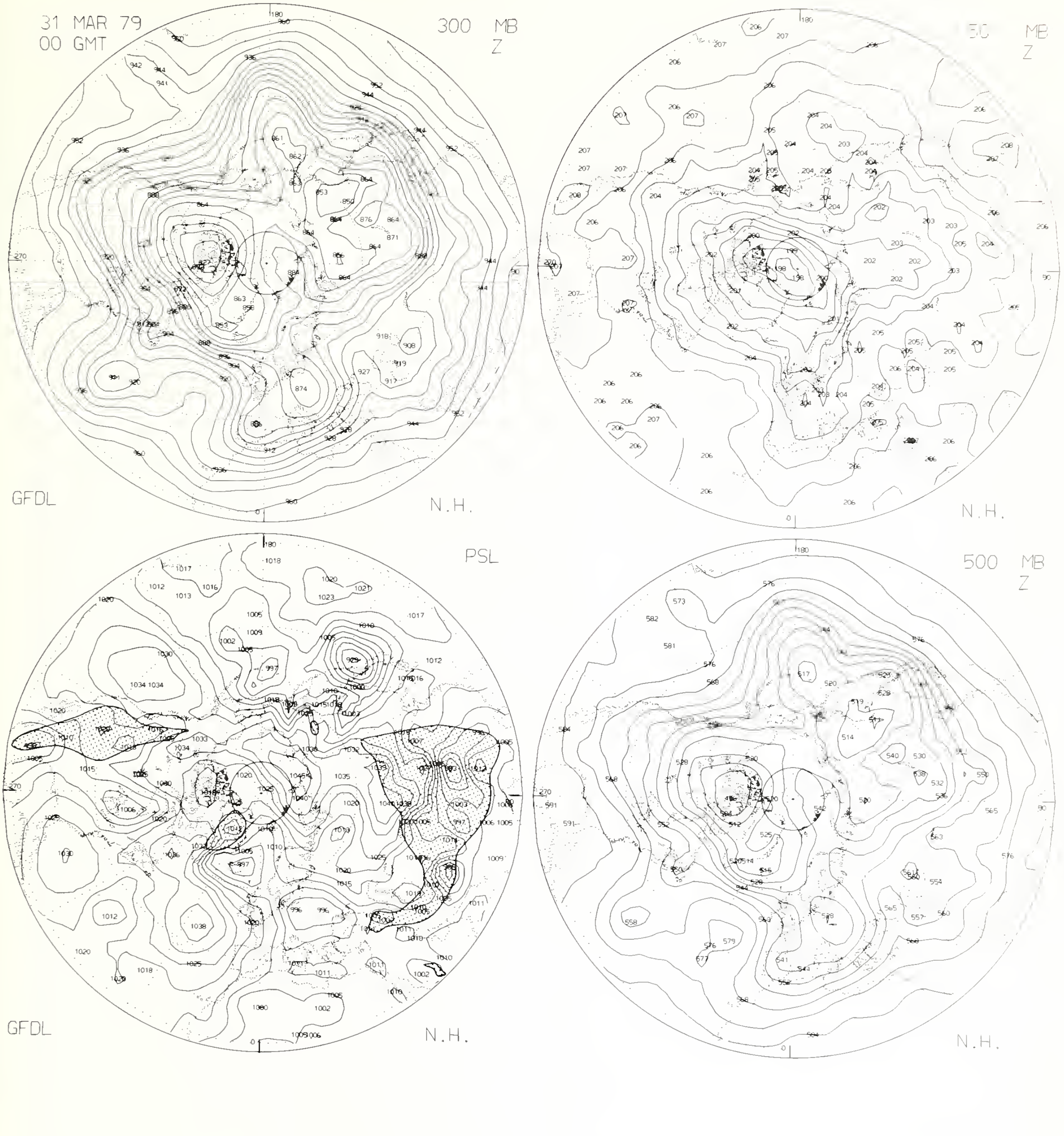
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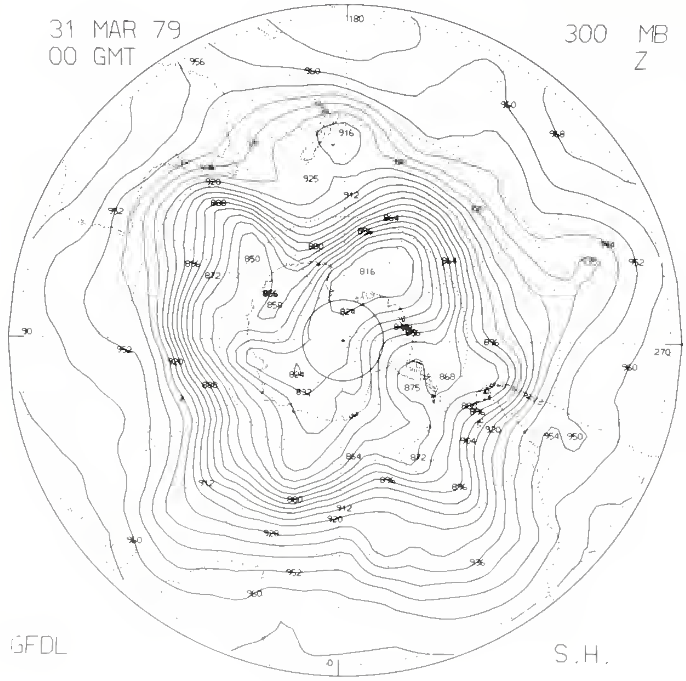
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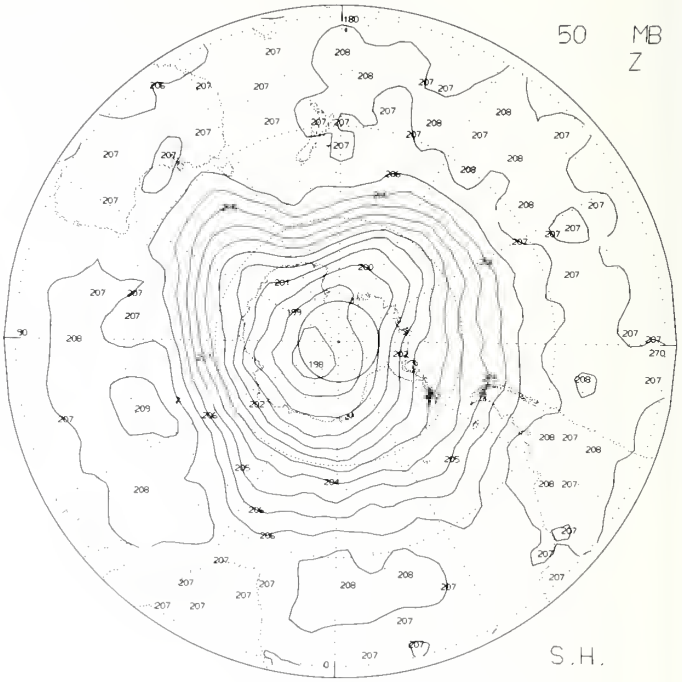
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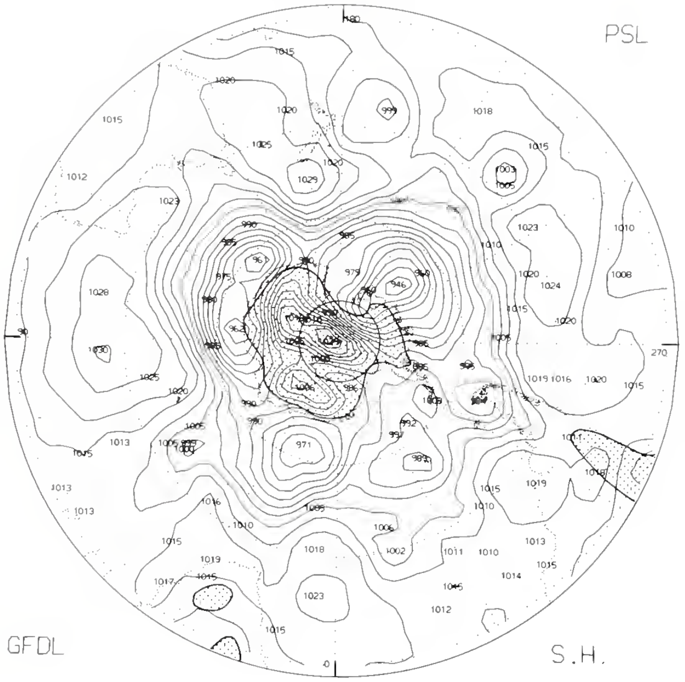
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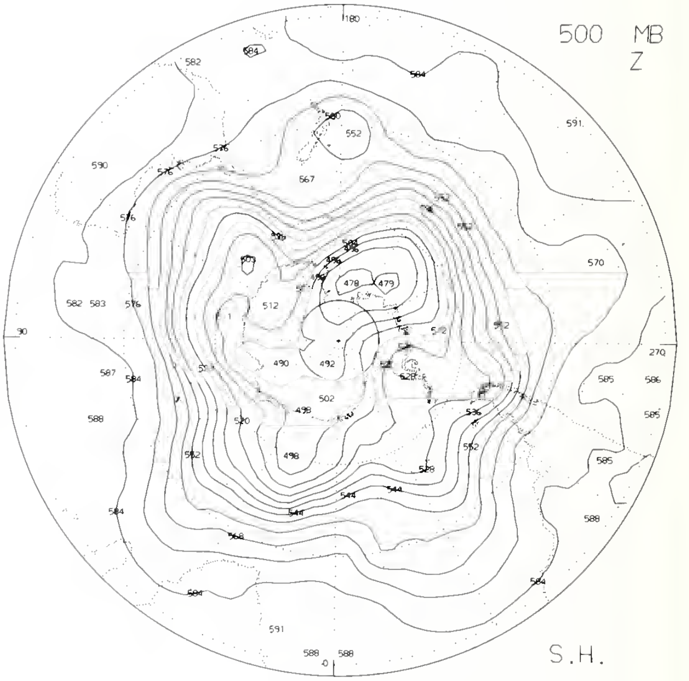
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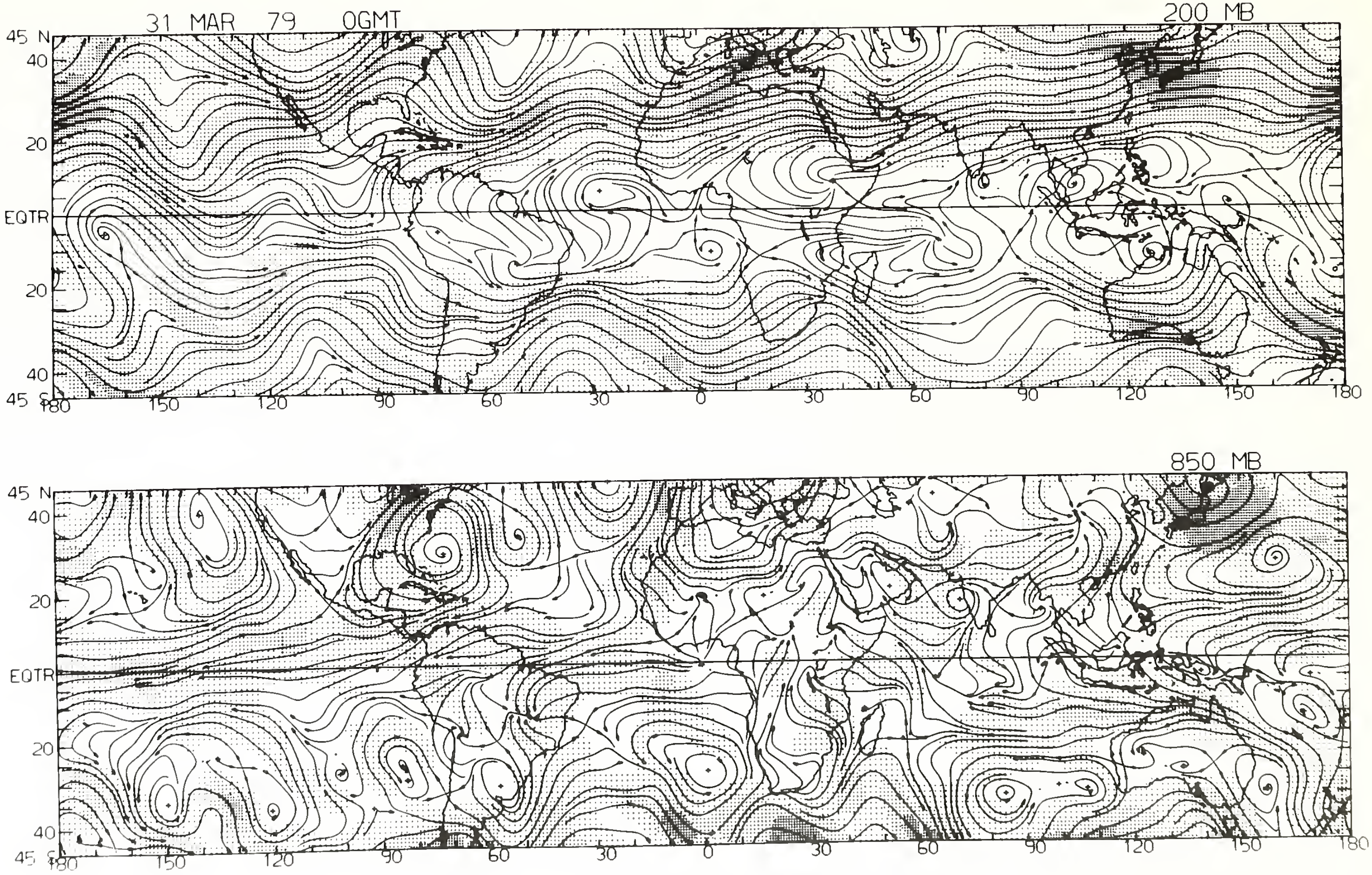
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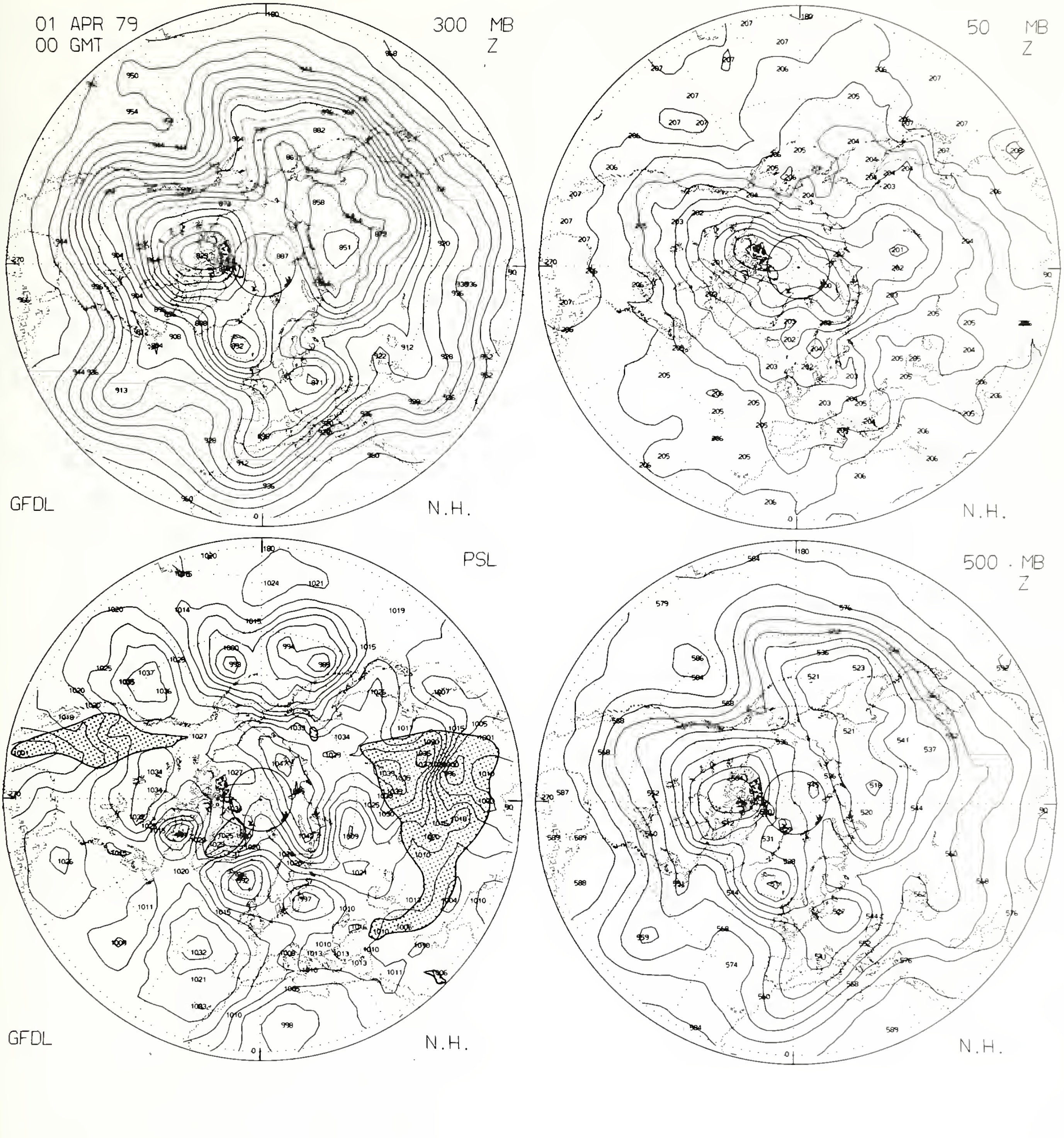
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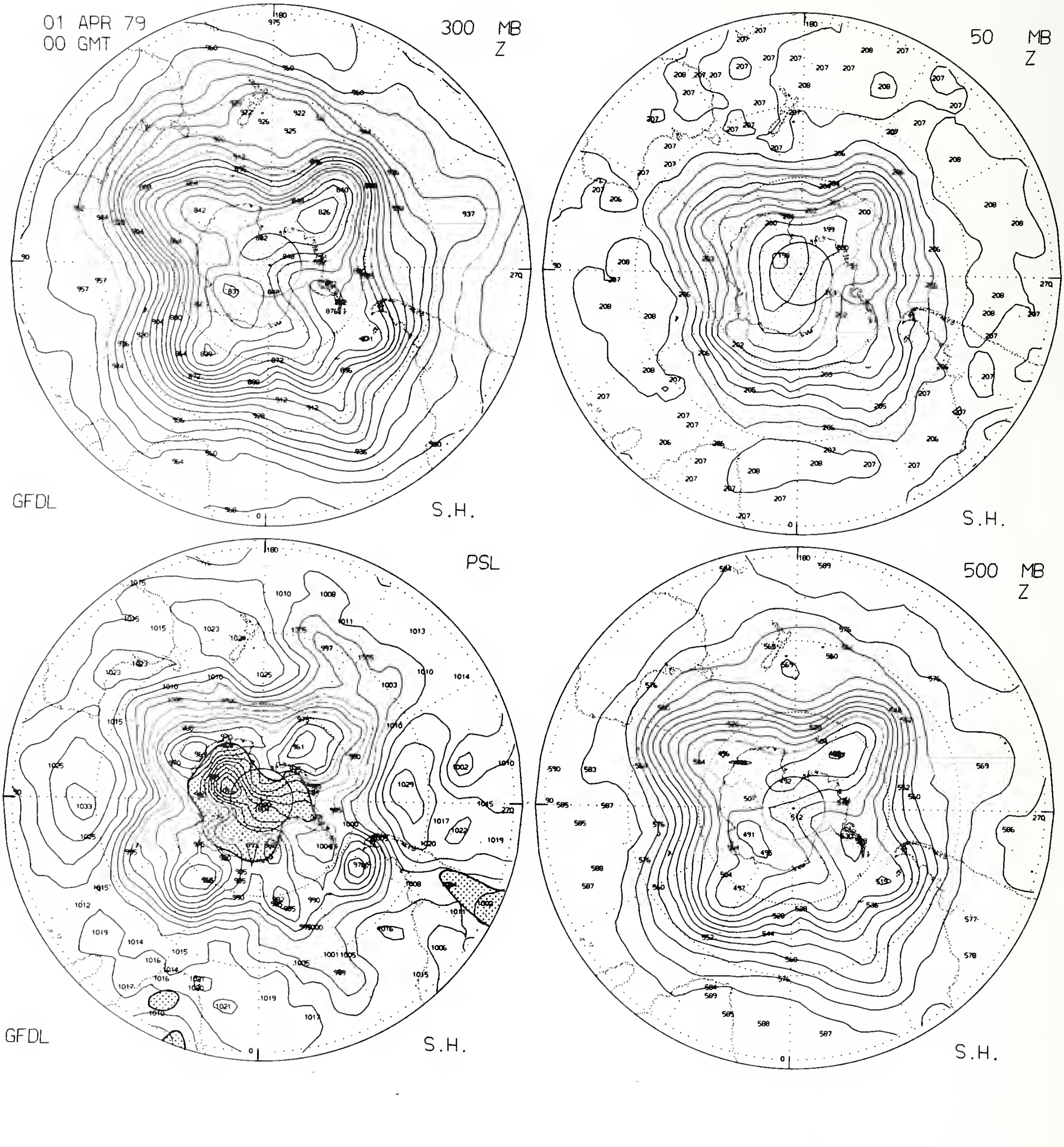
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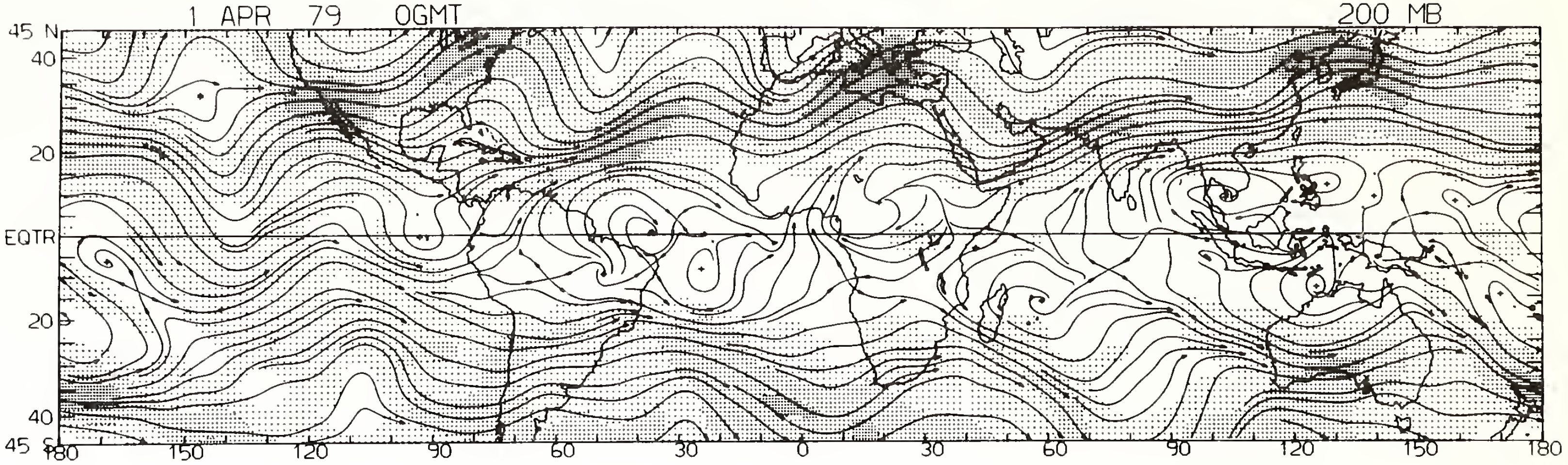
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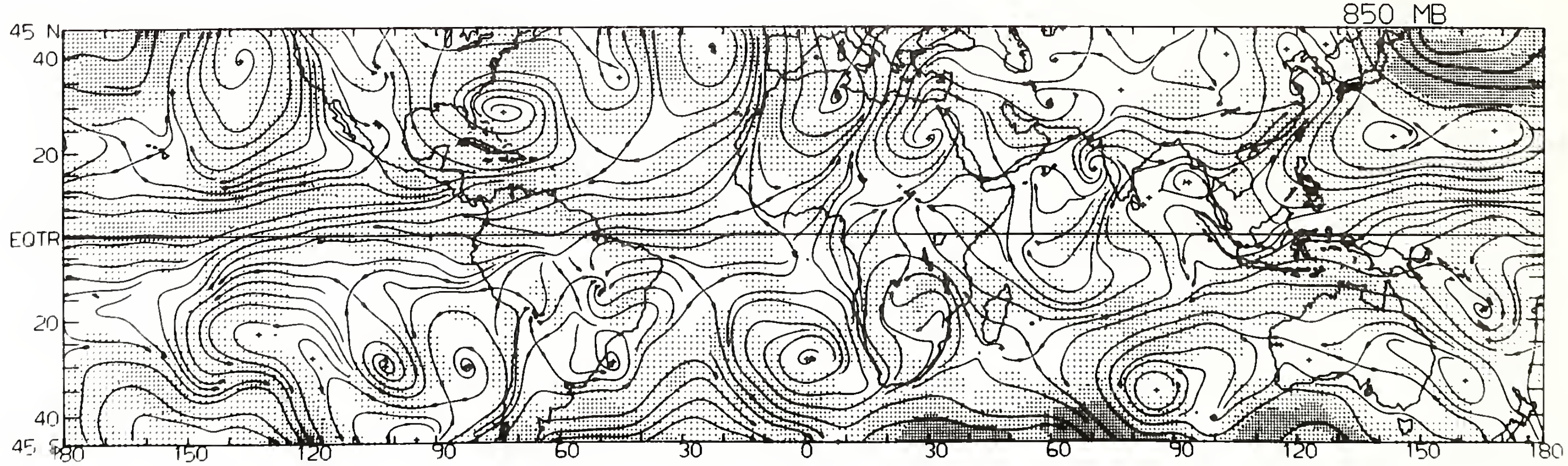
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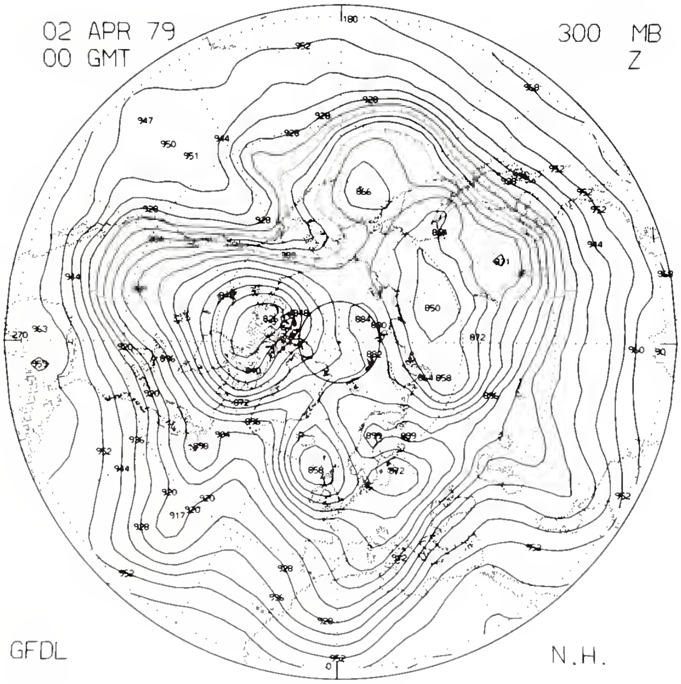
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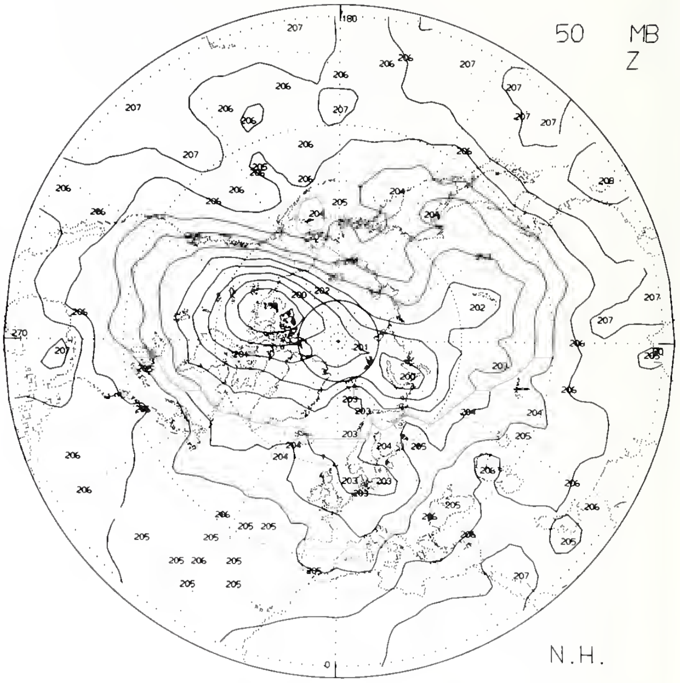
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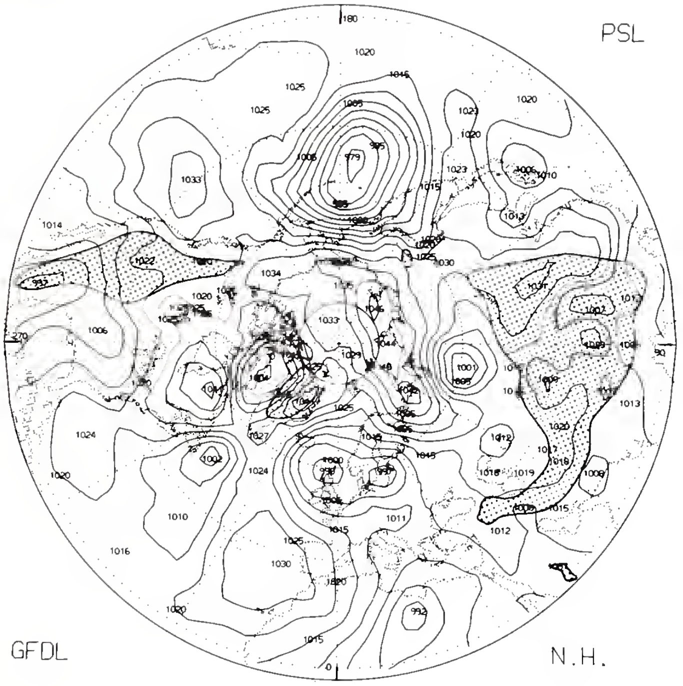
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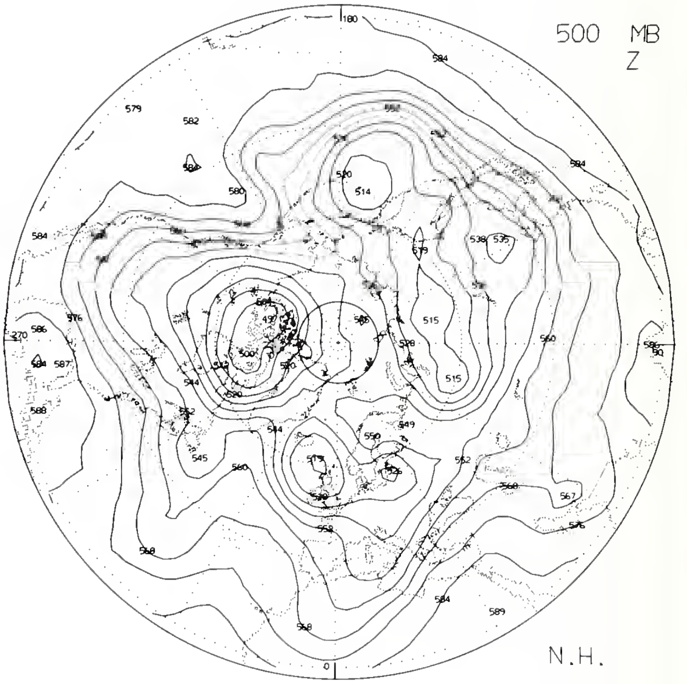
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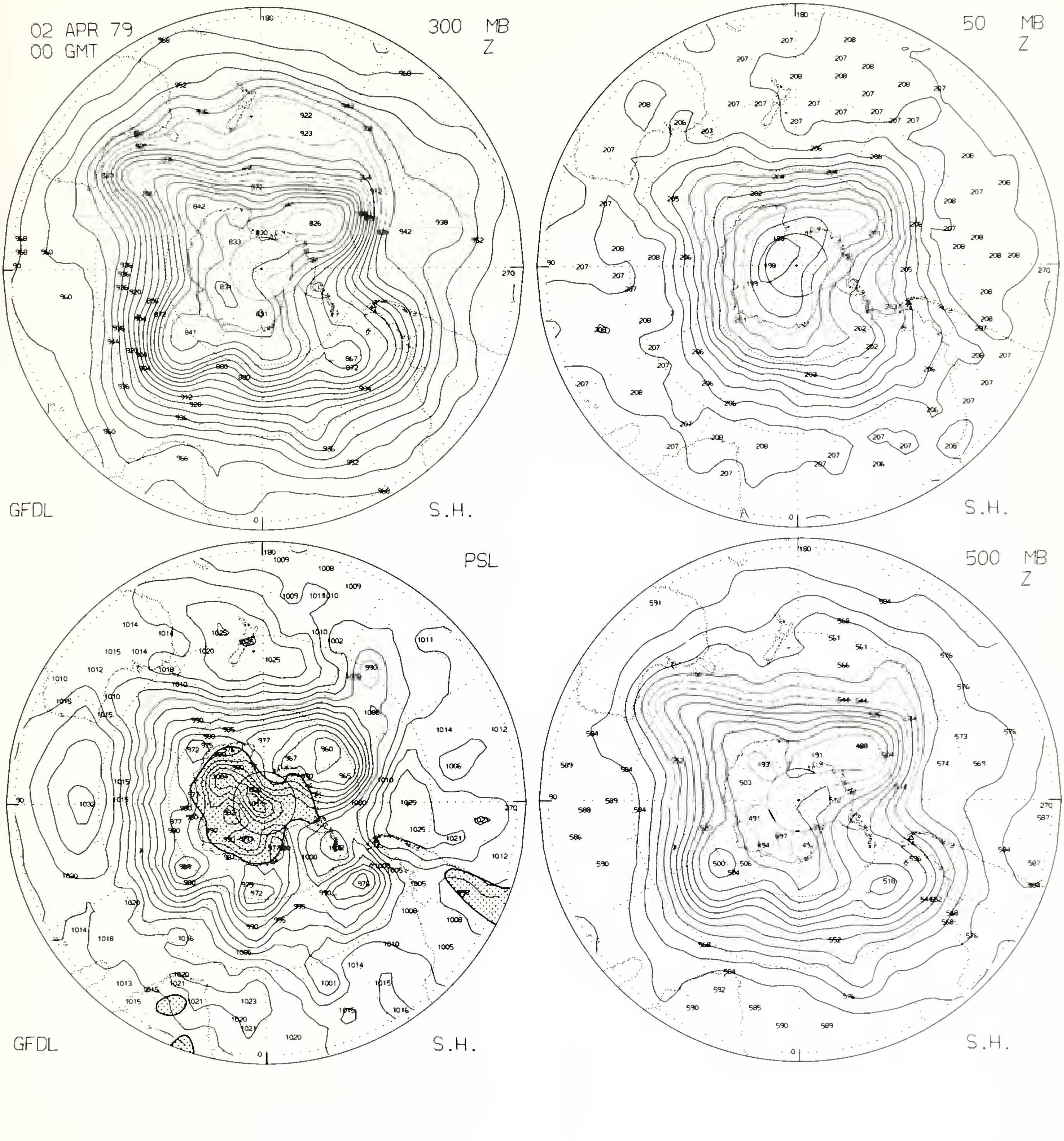
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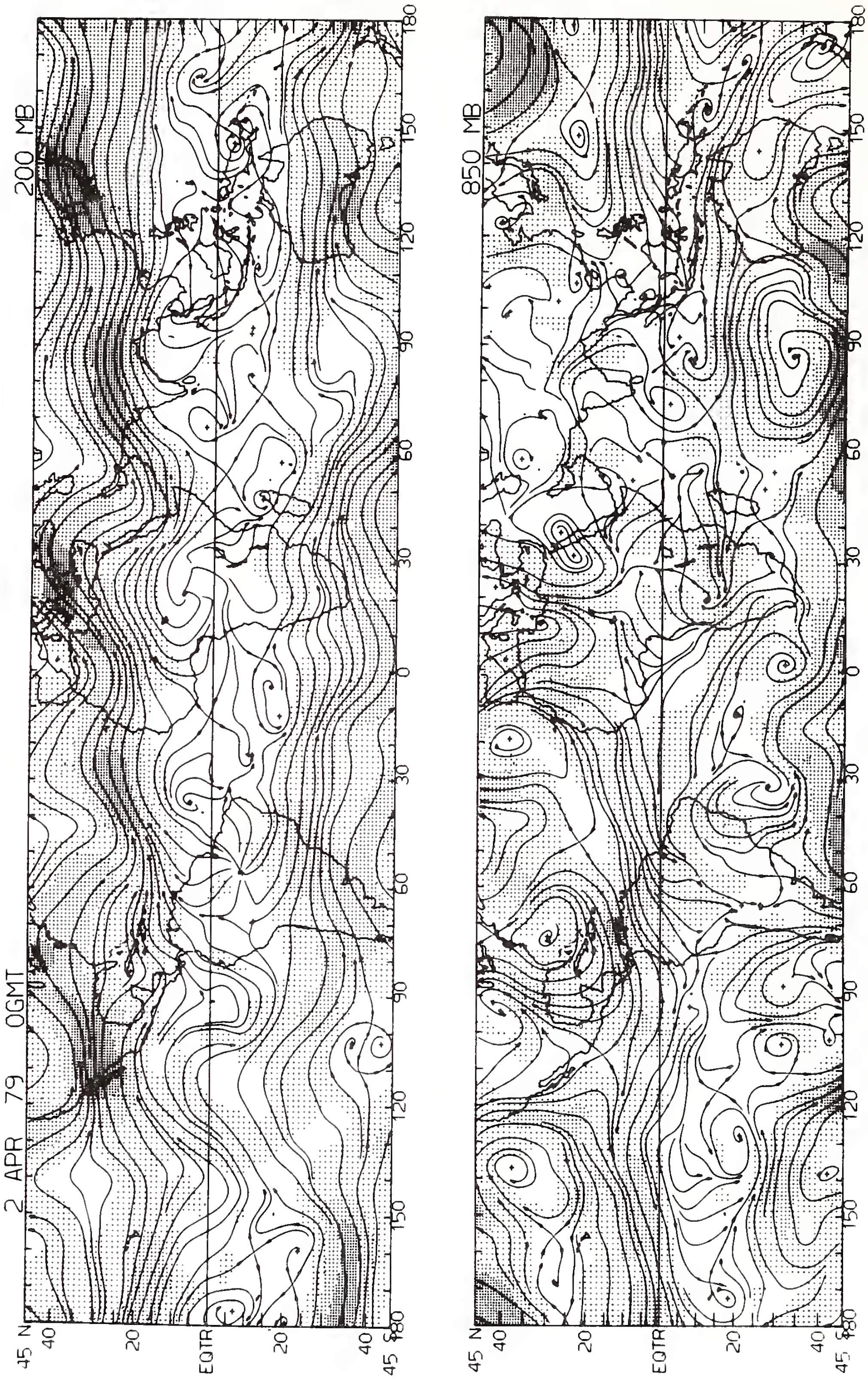
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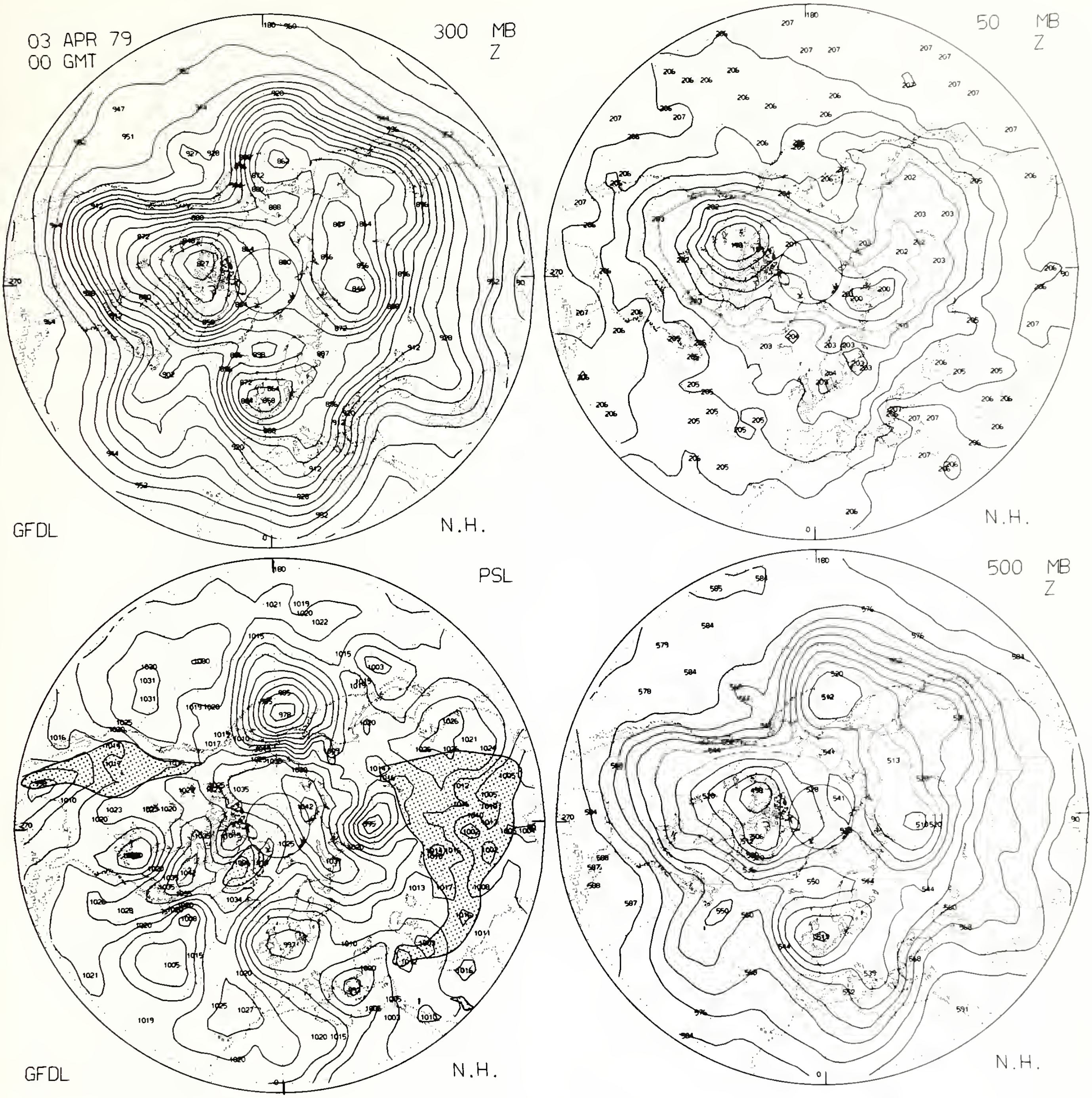
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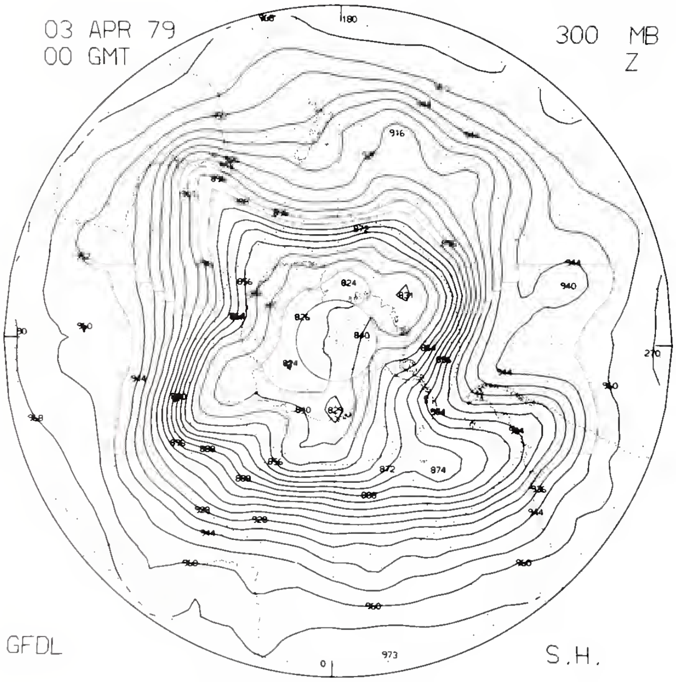
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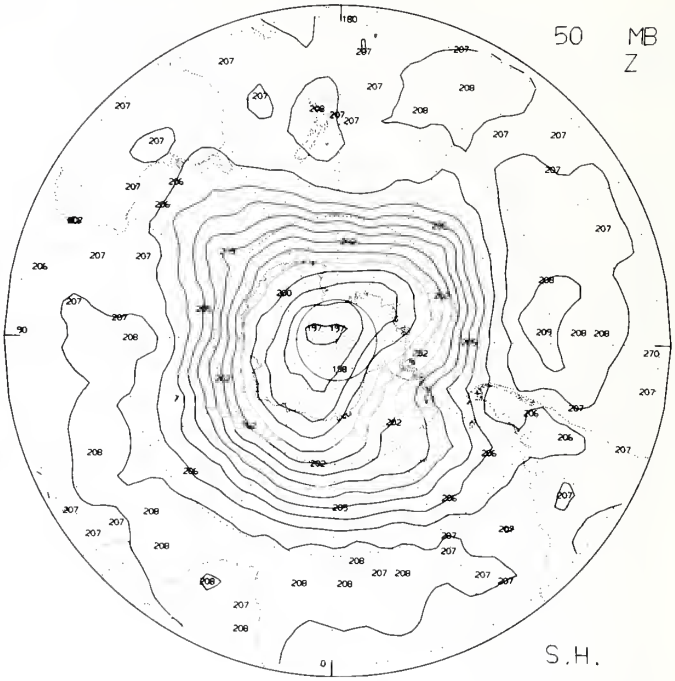
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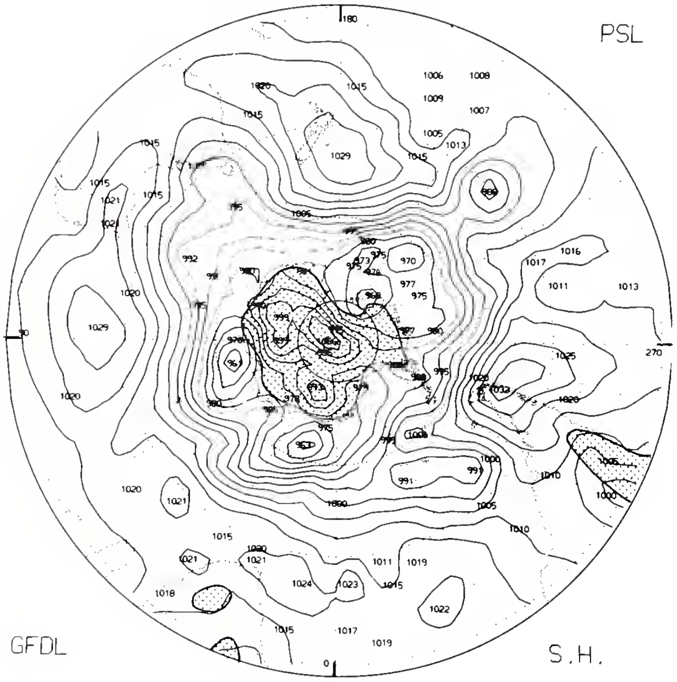
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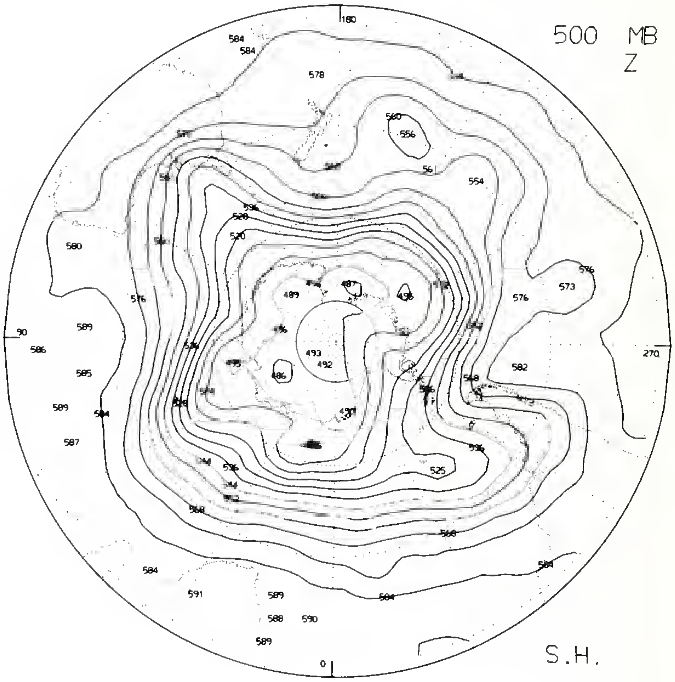
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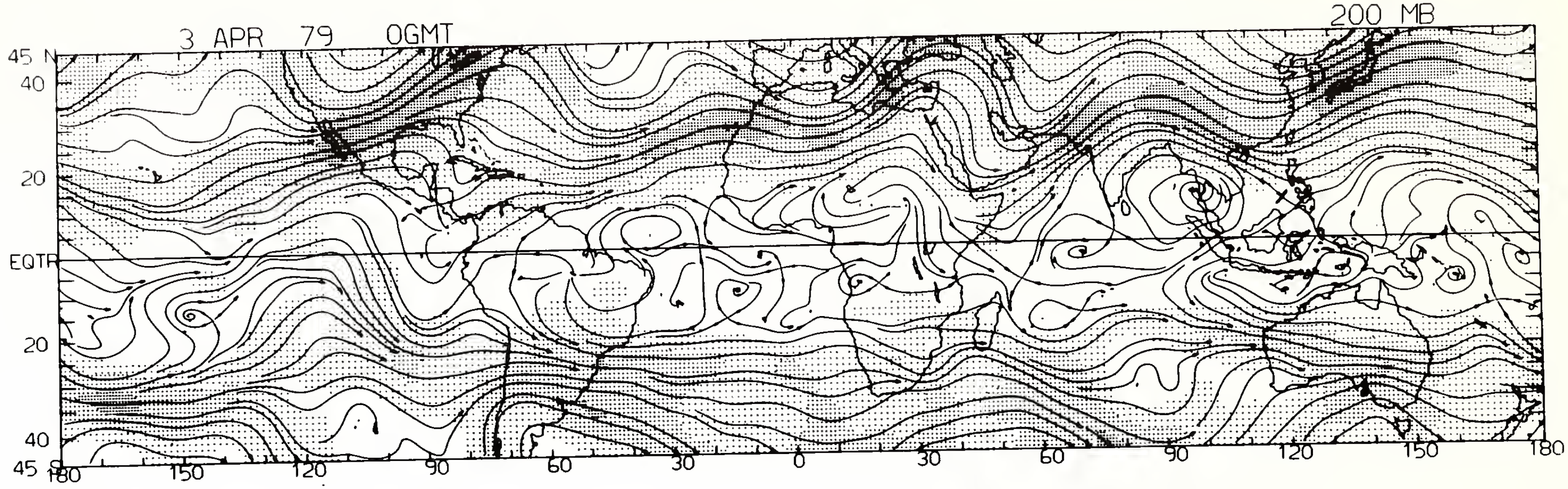
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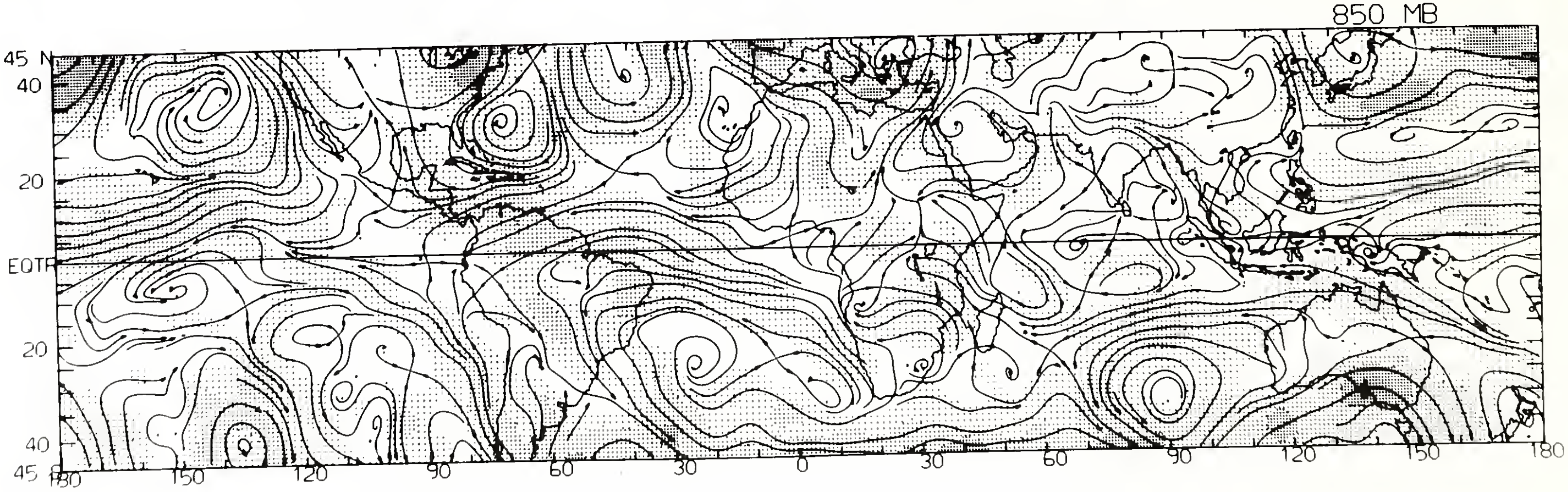
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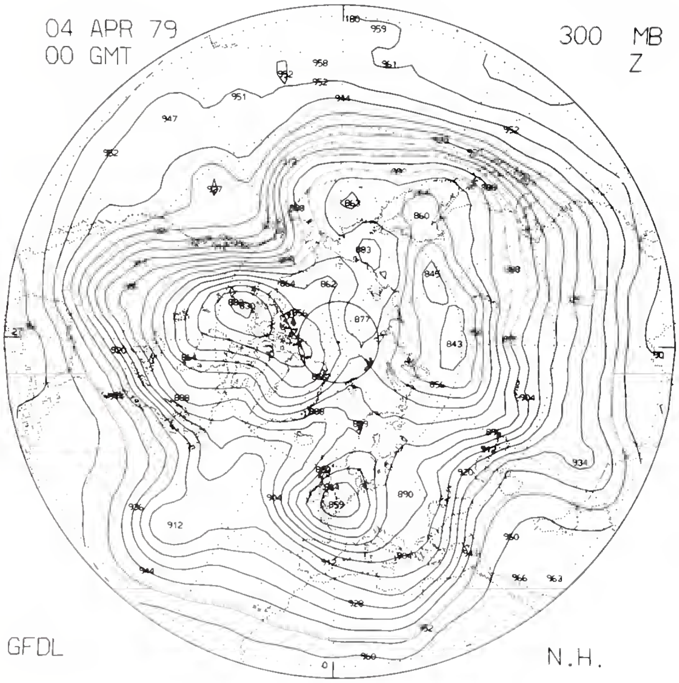
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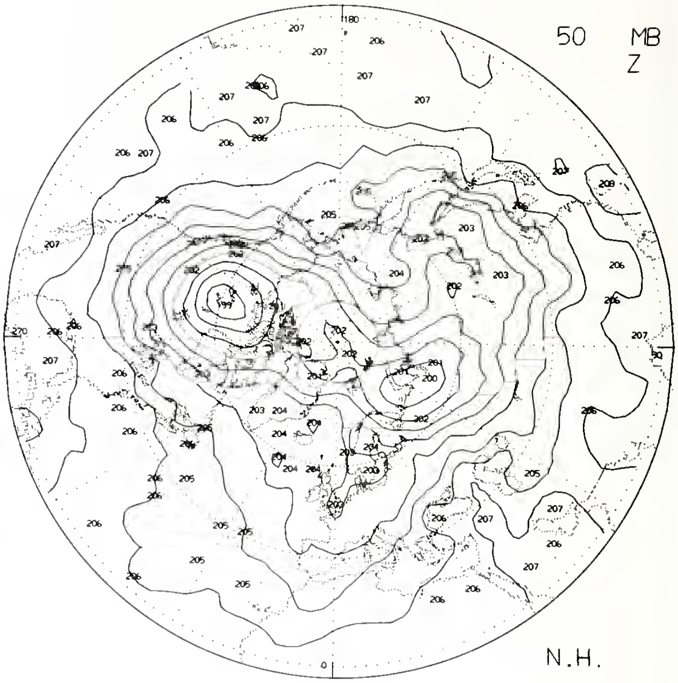
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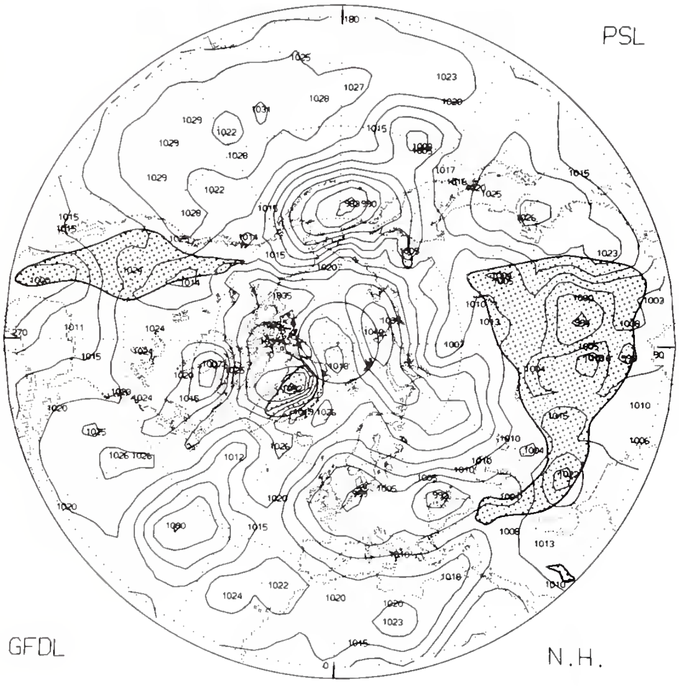
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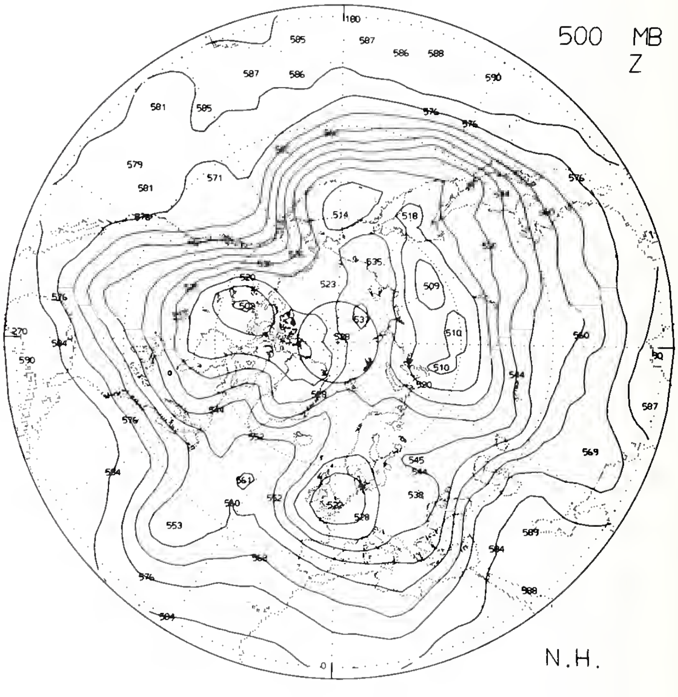
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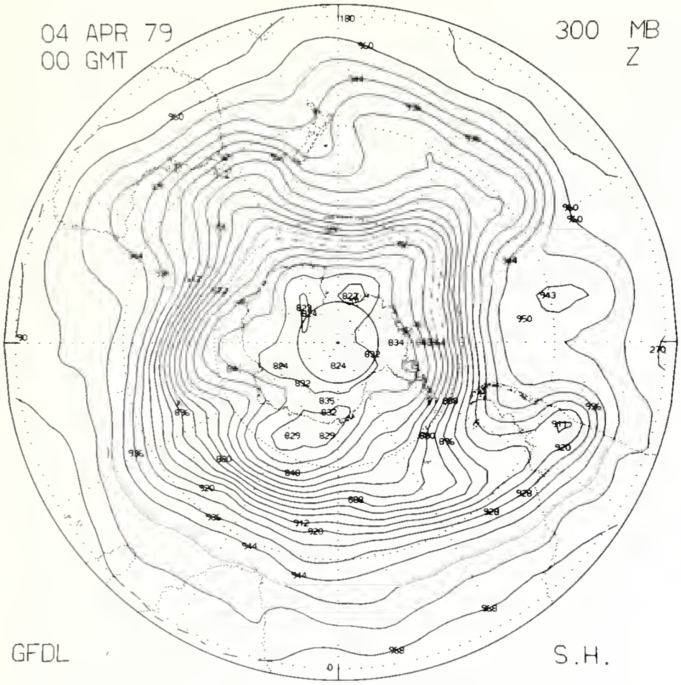
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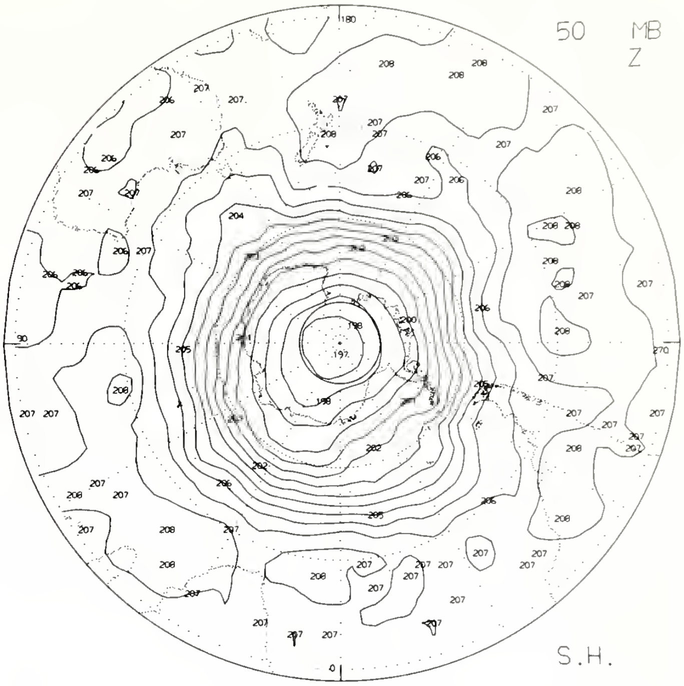
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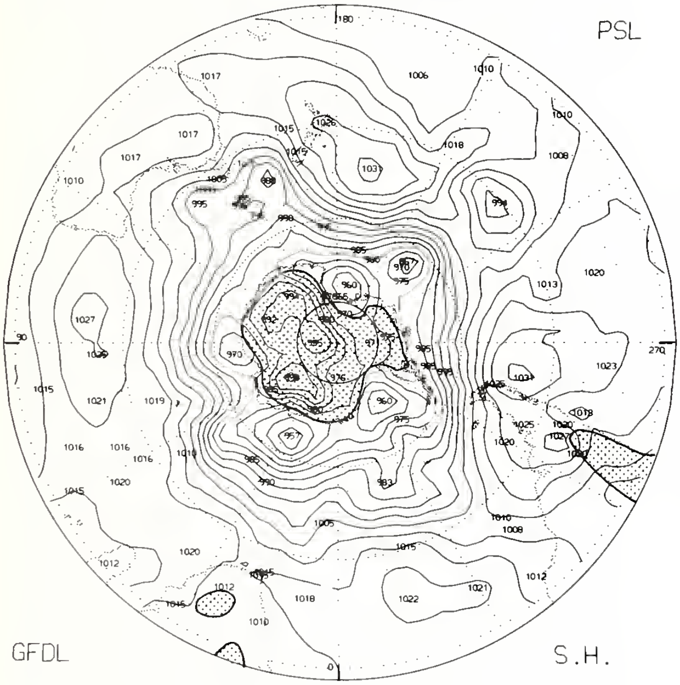
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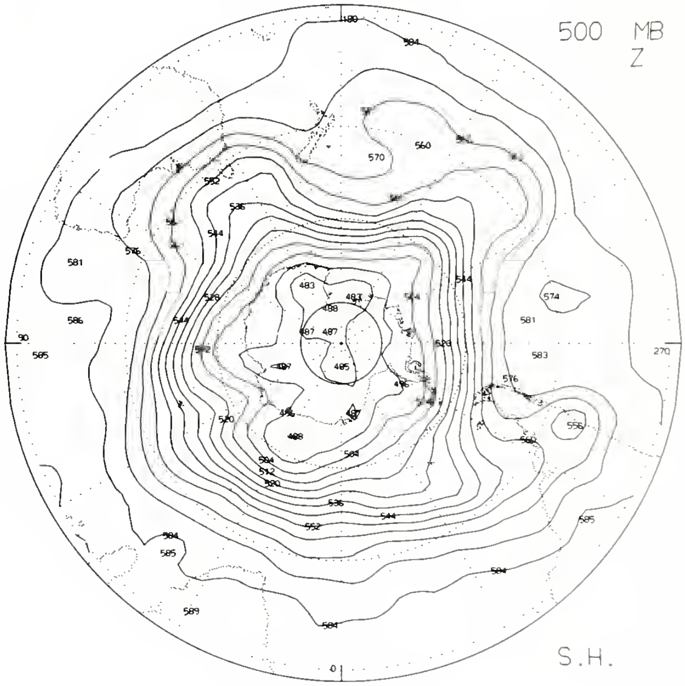
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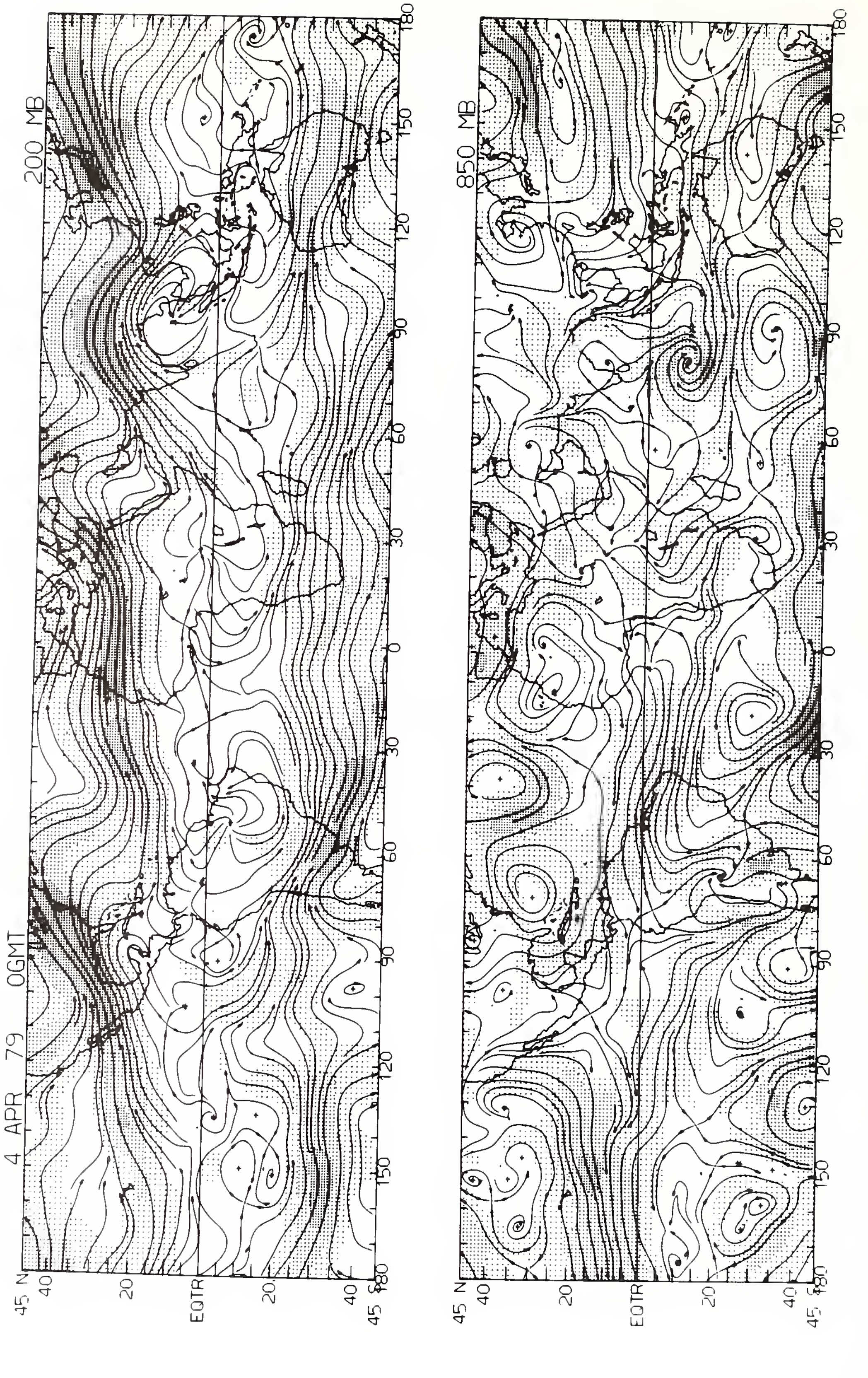
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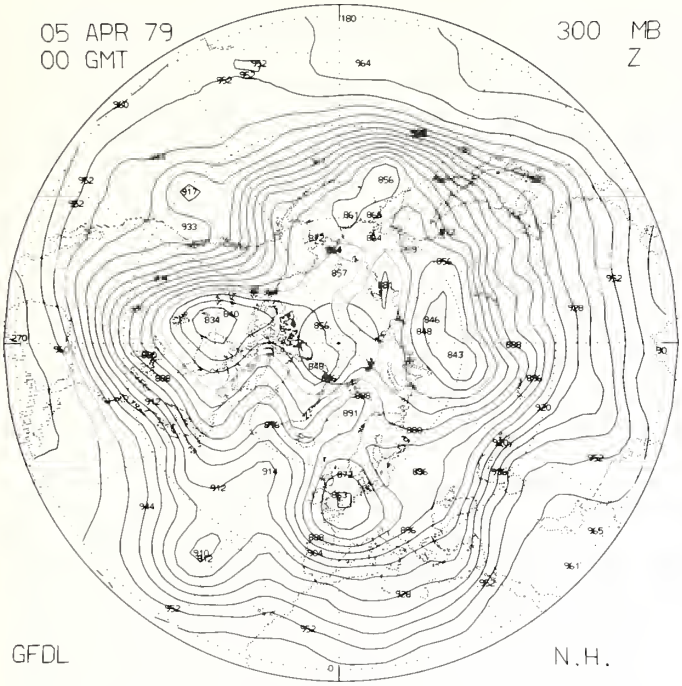
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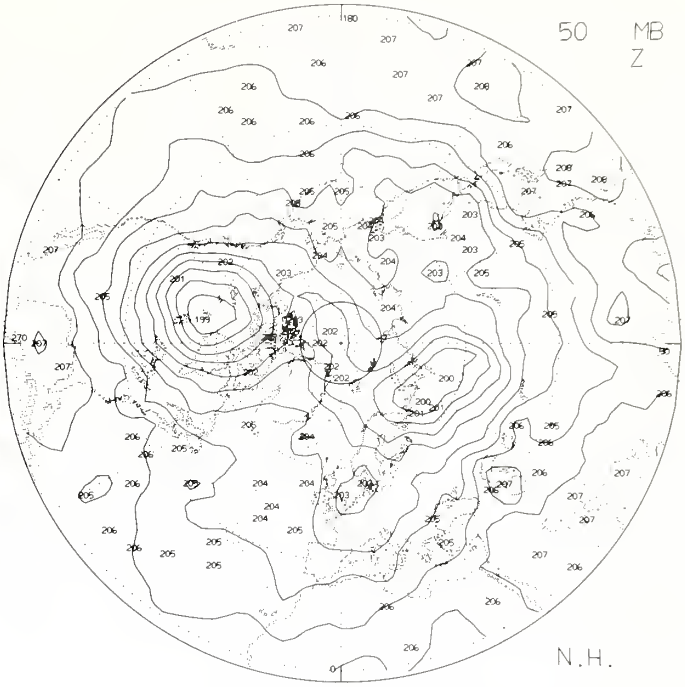
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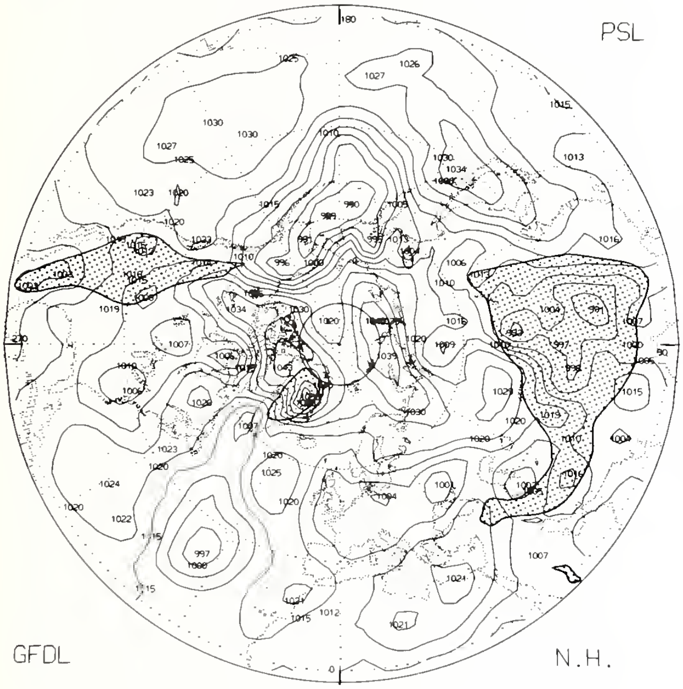
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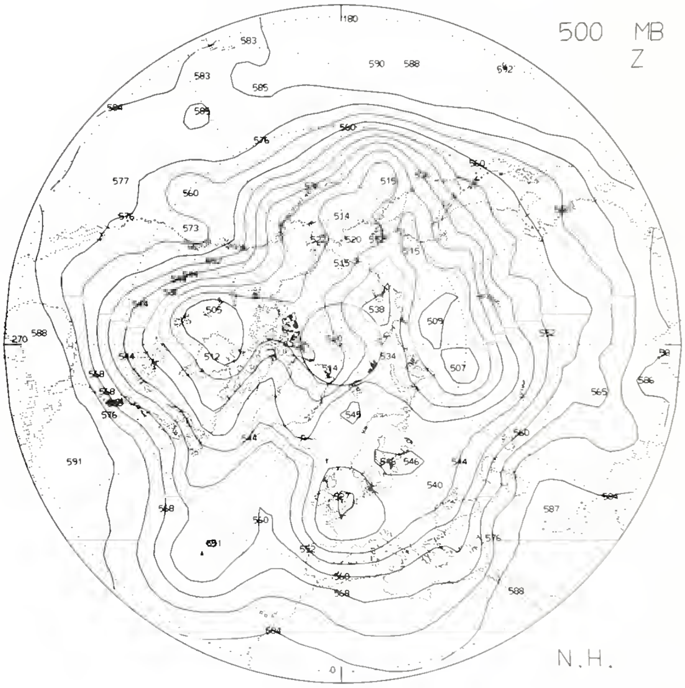
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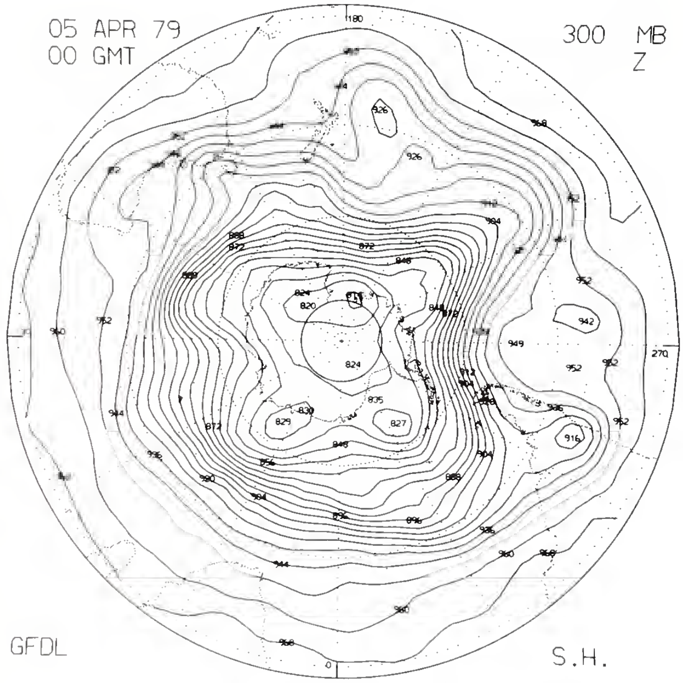
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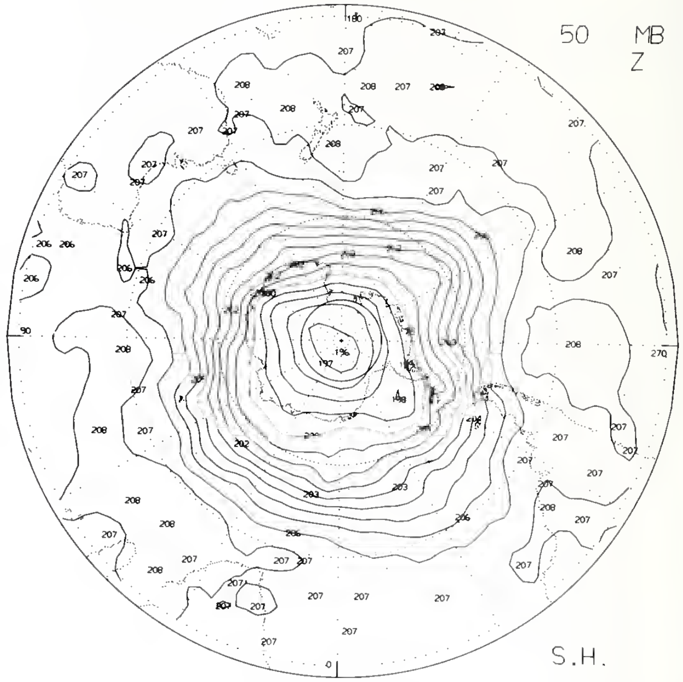
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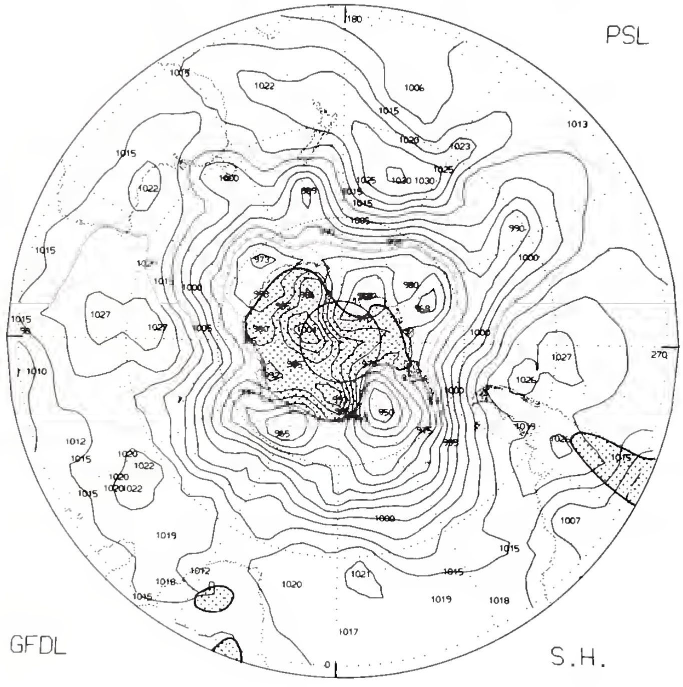
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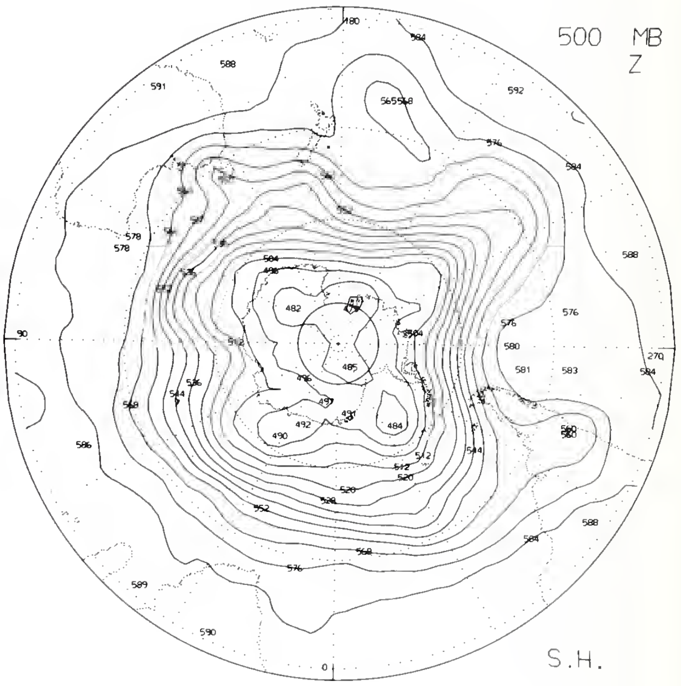
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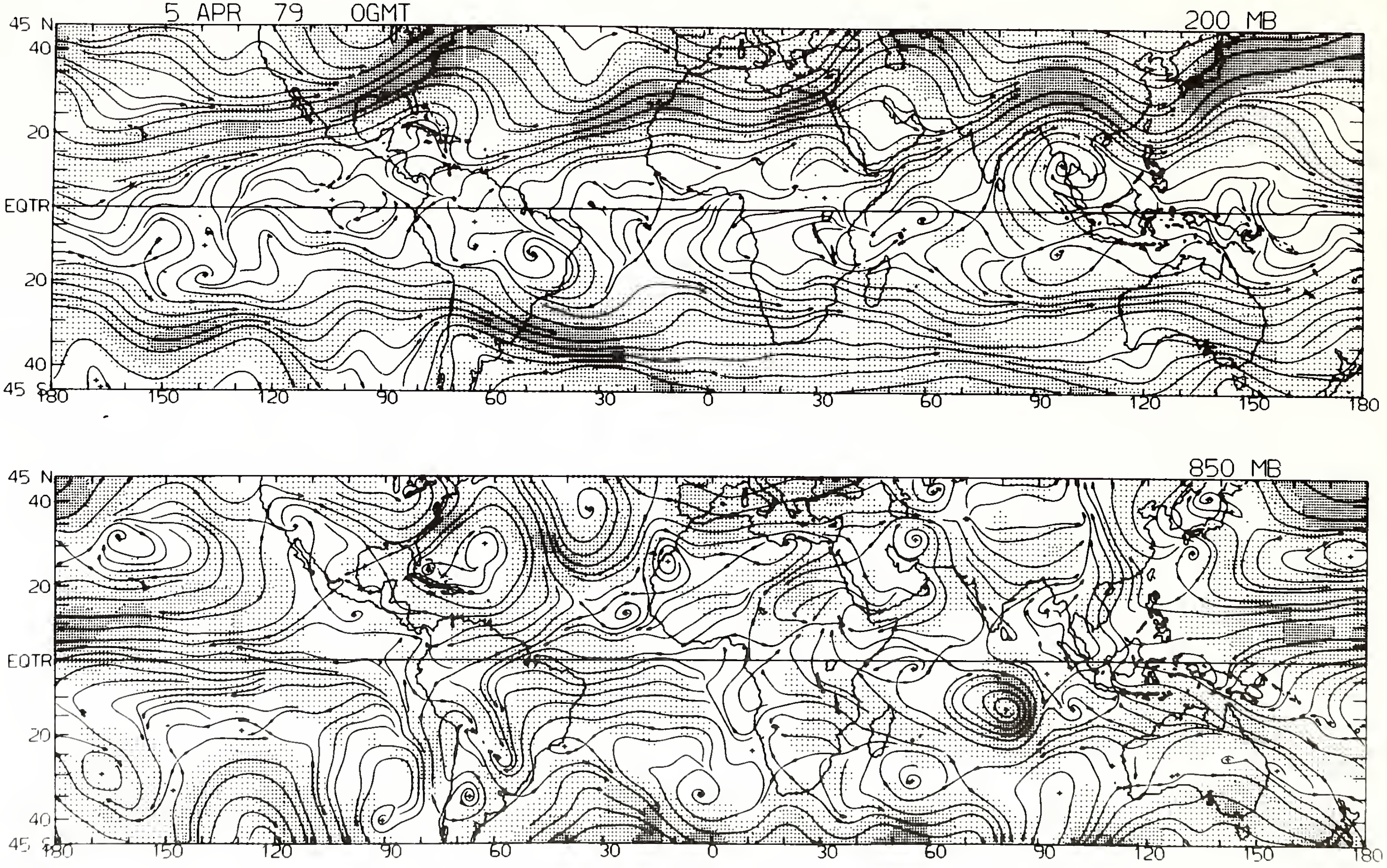5 APR 79 0GMT
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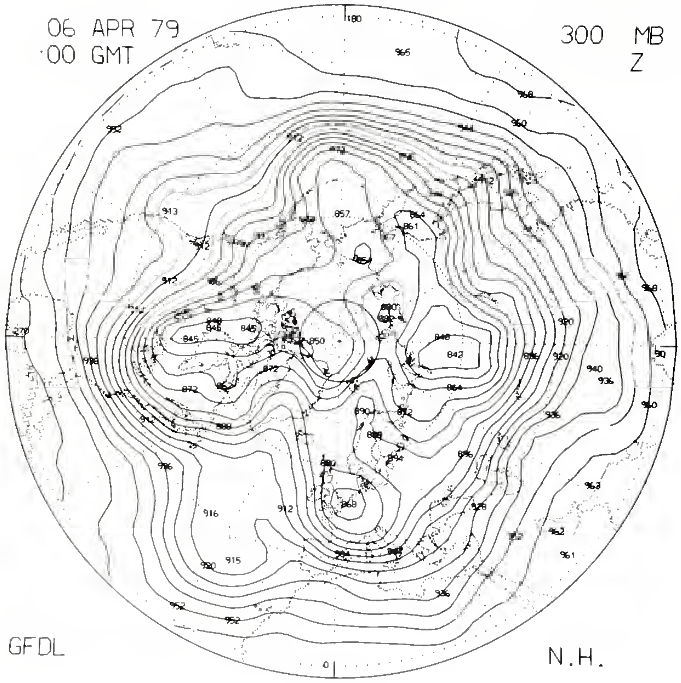
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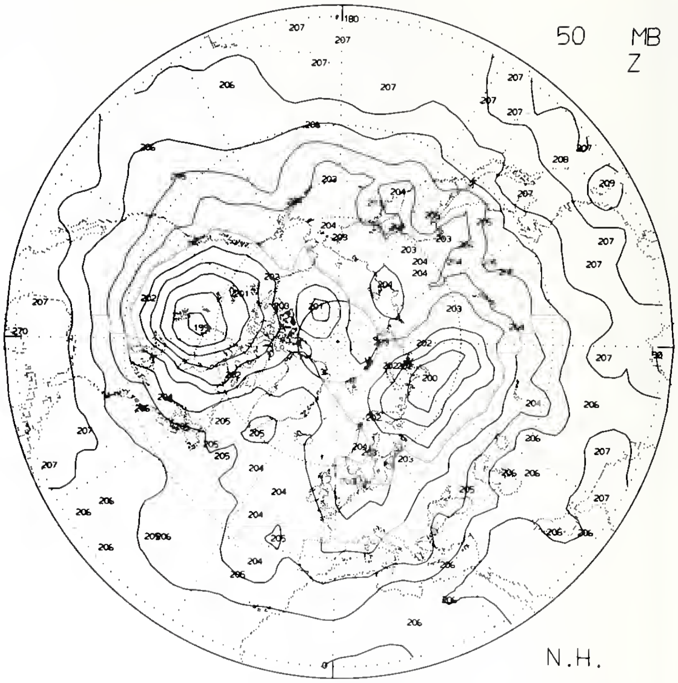
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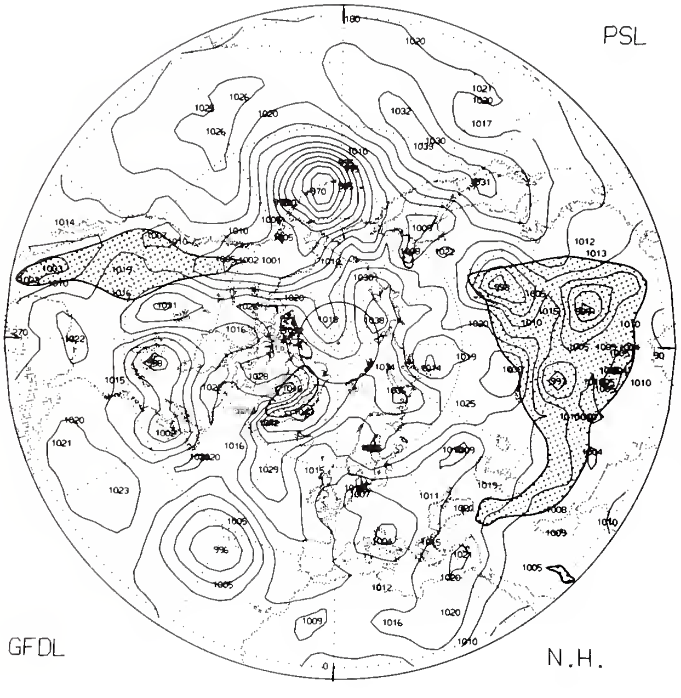
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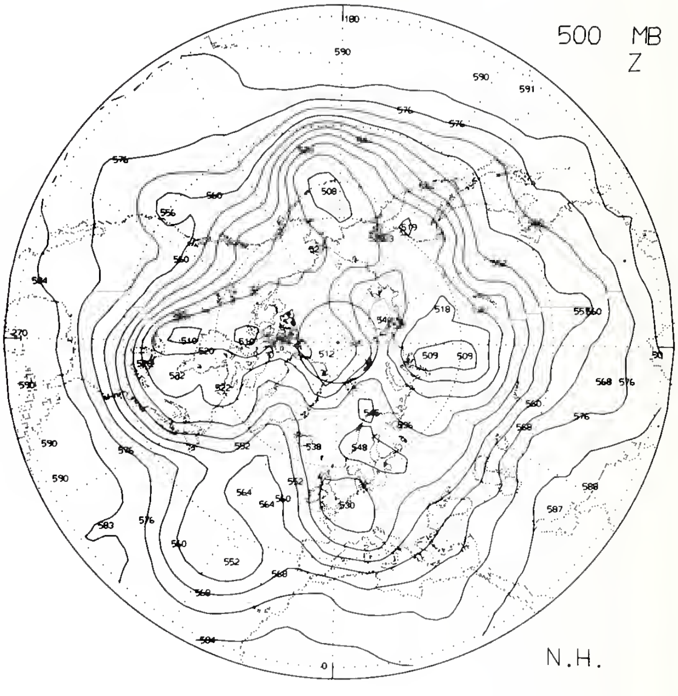
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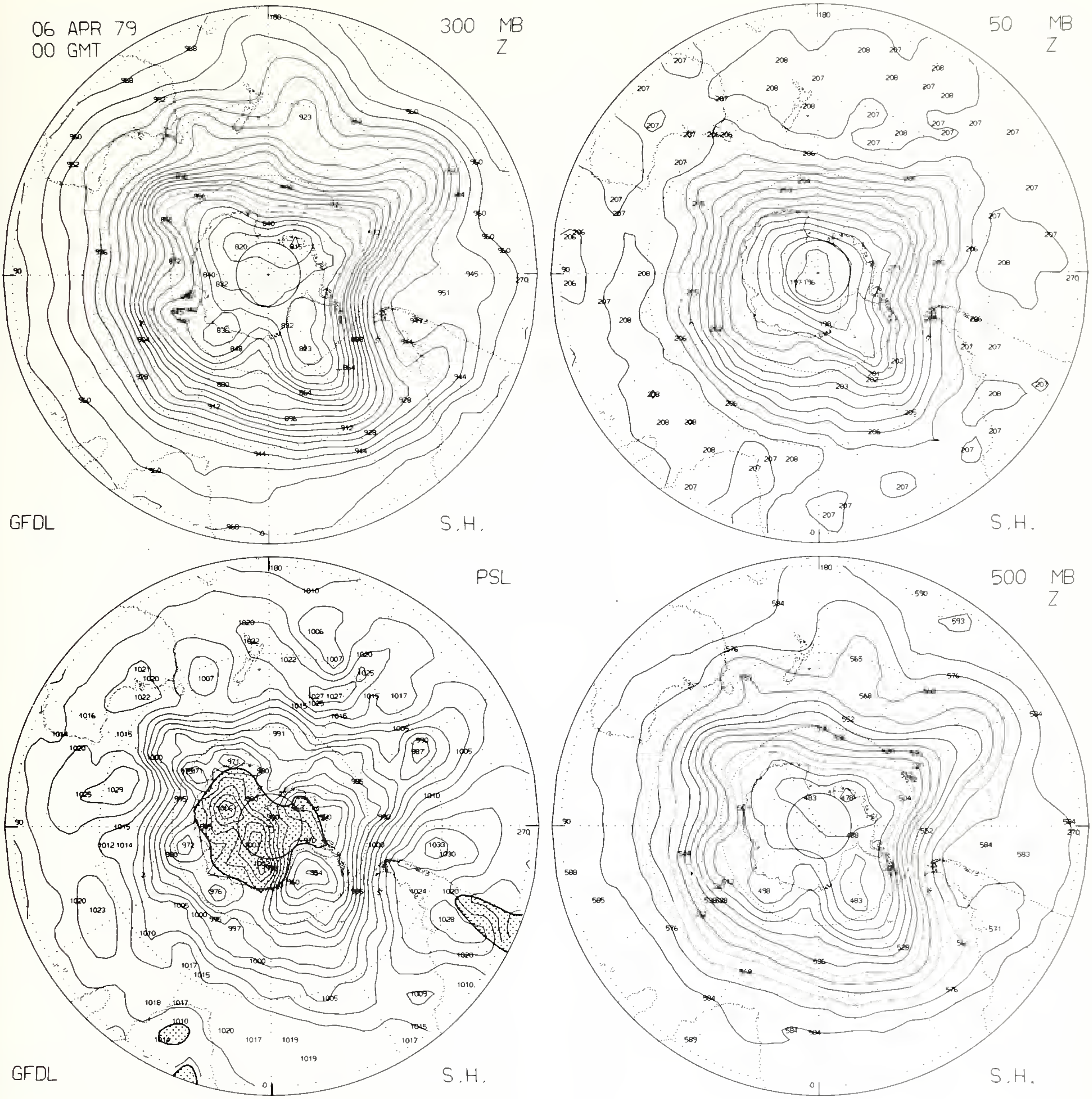
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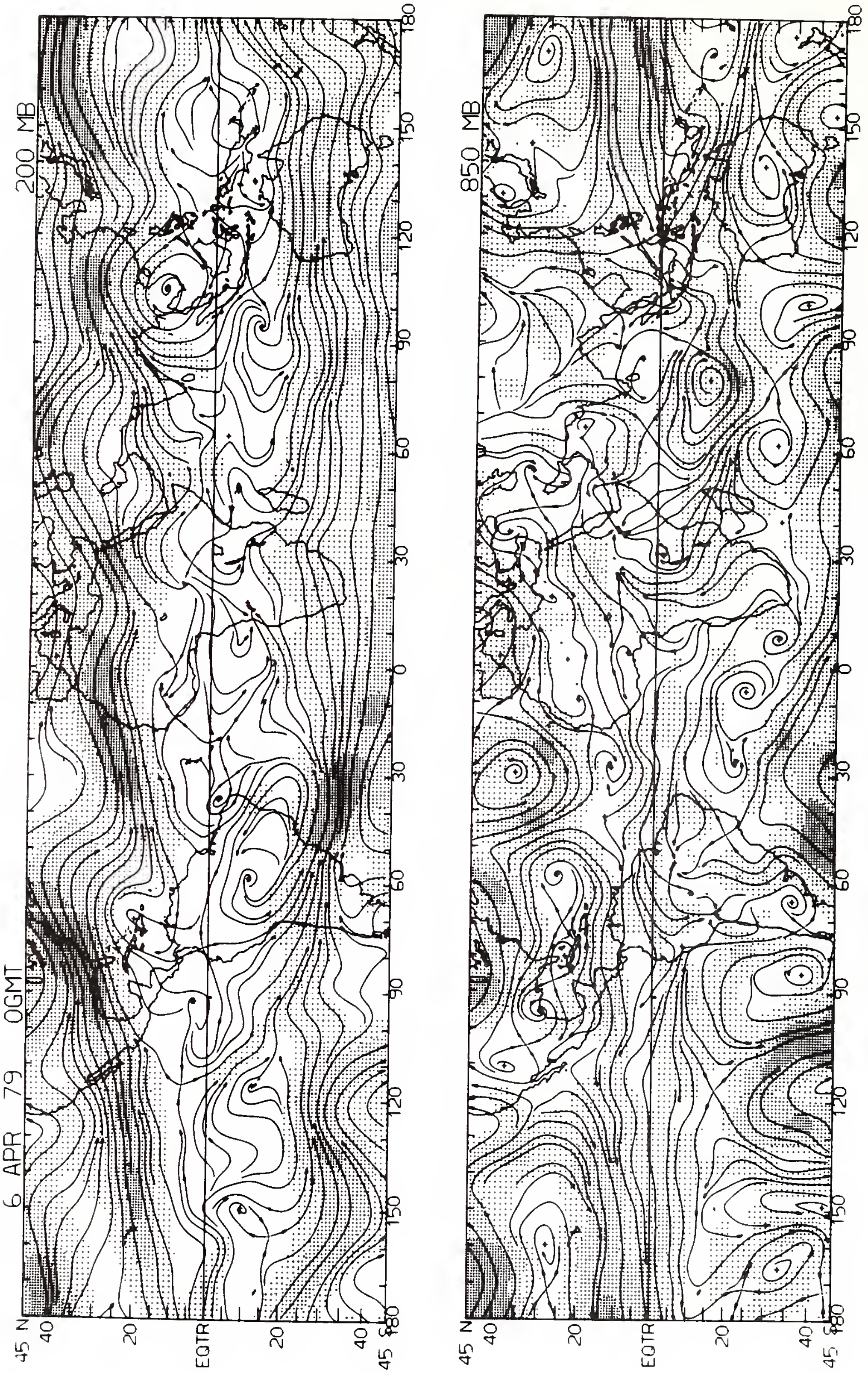
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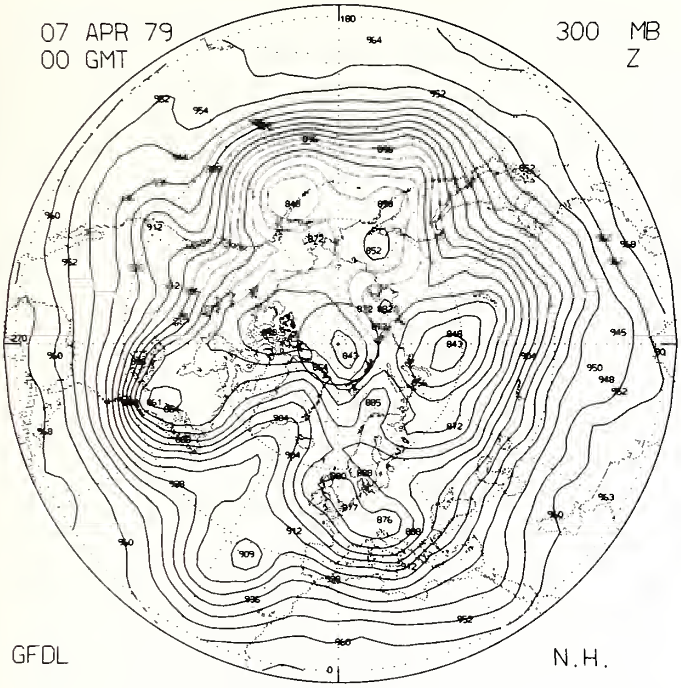
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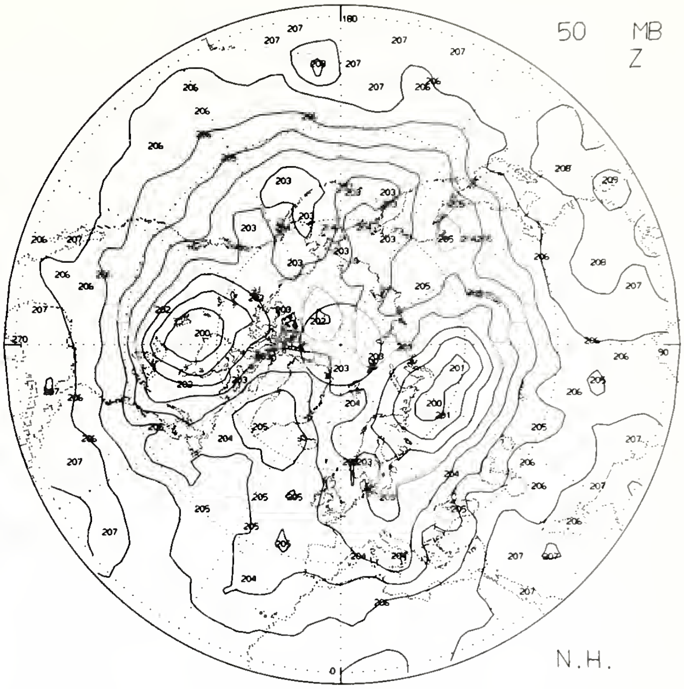
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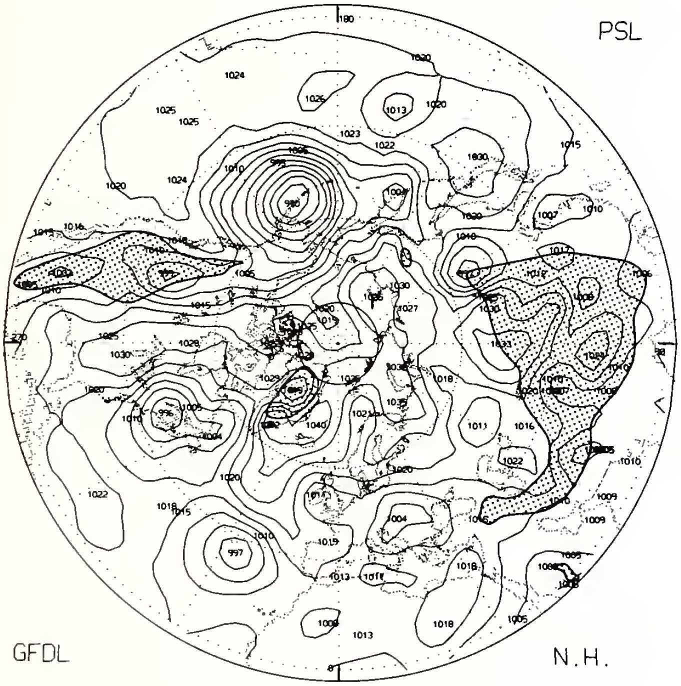
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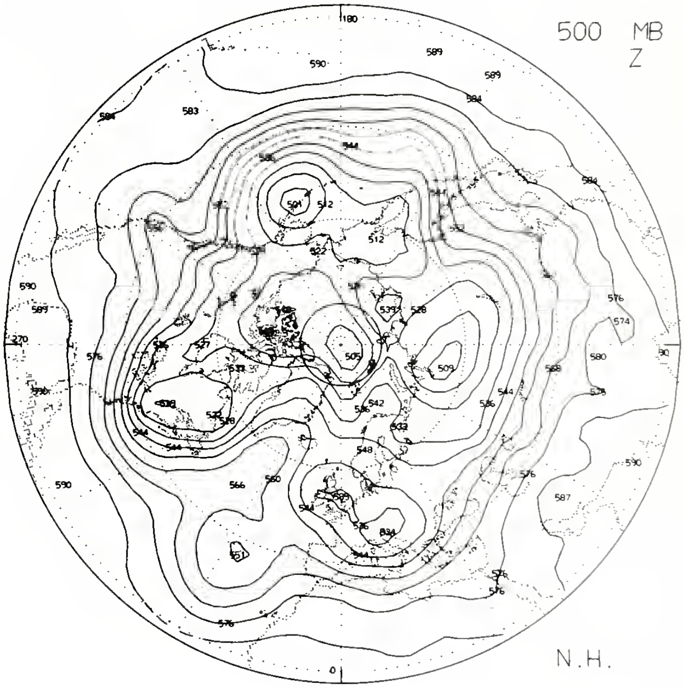
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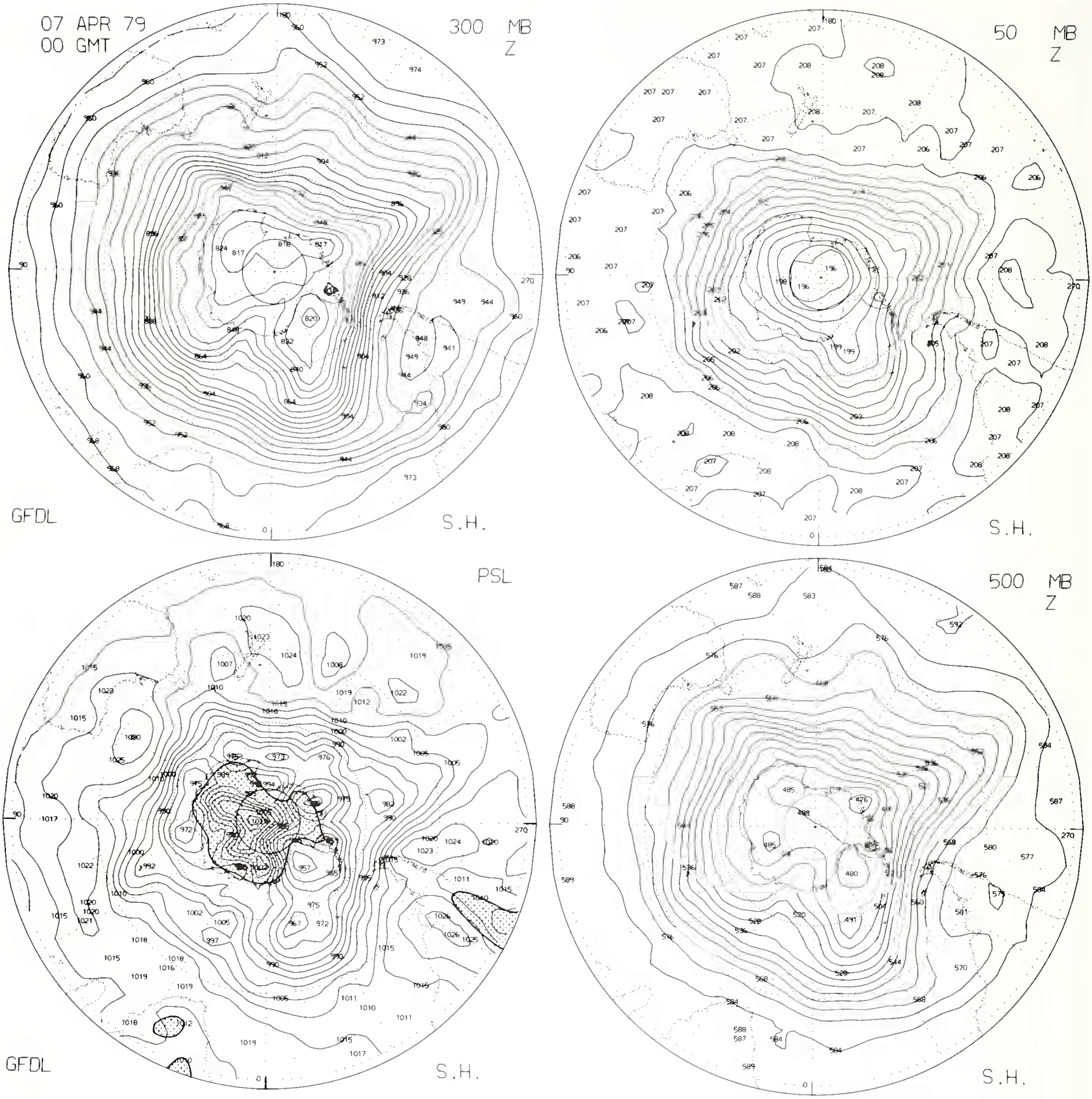
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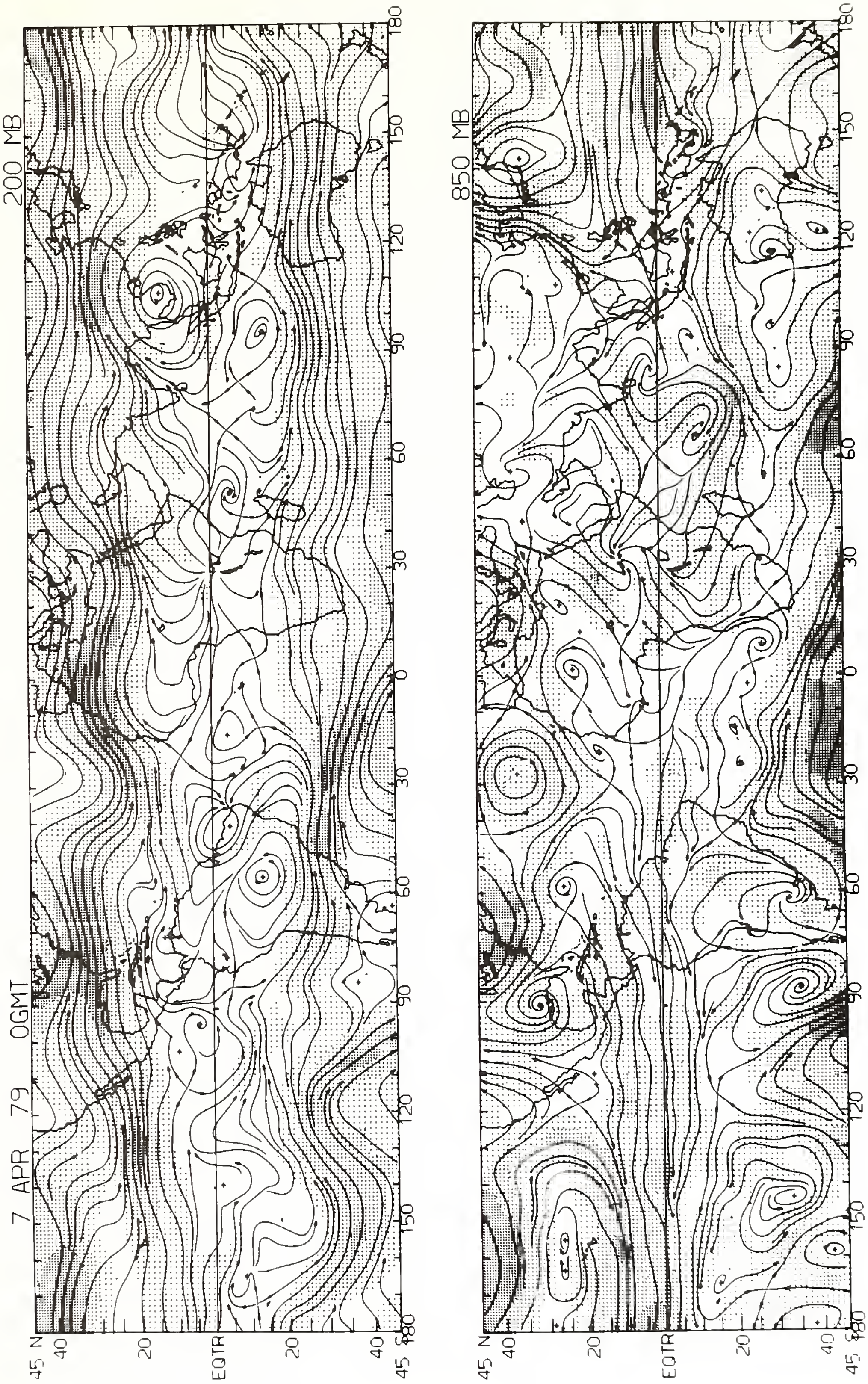
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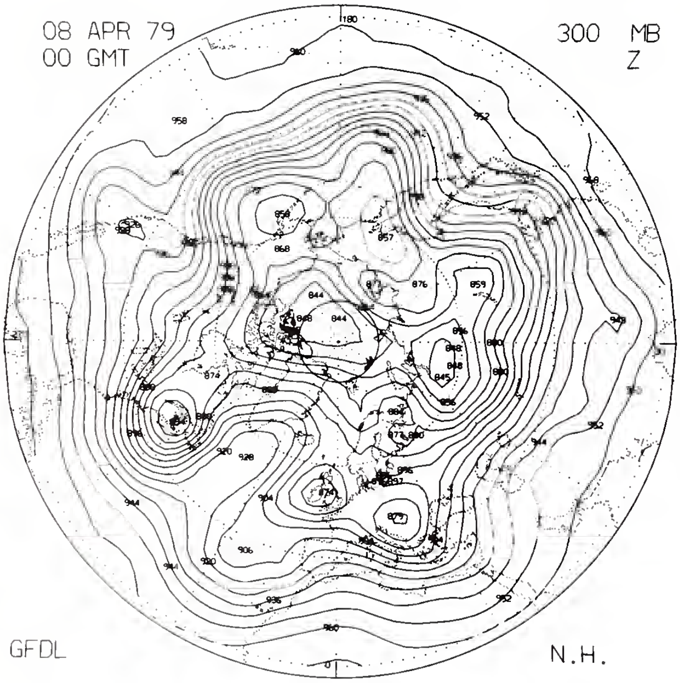
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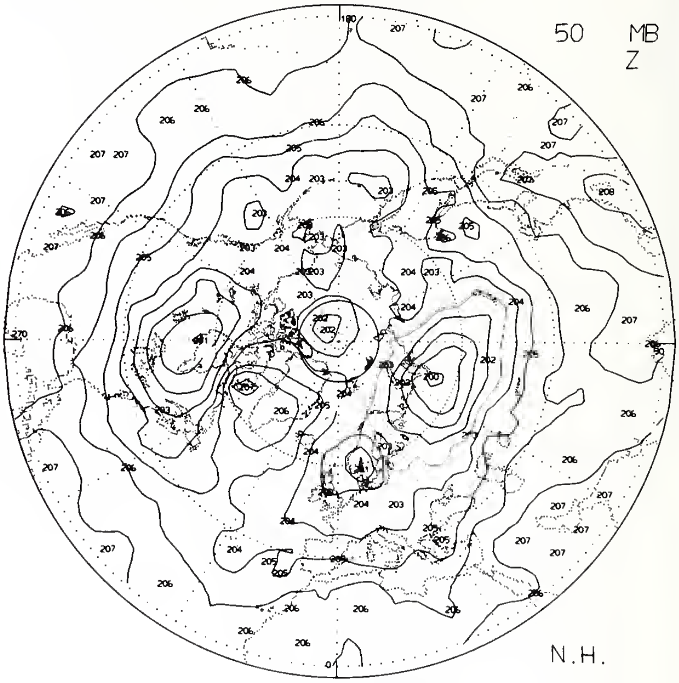
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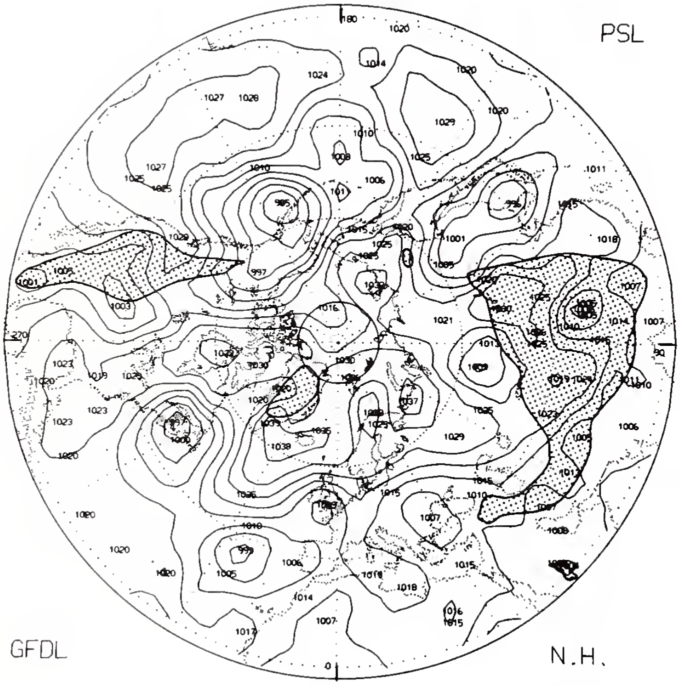
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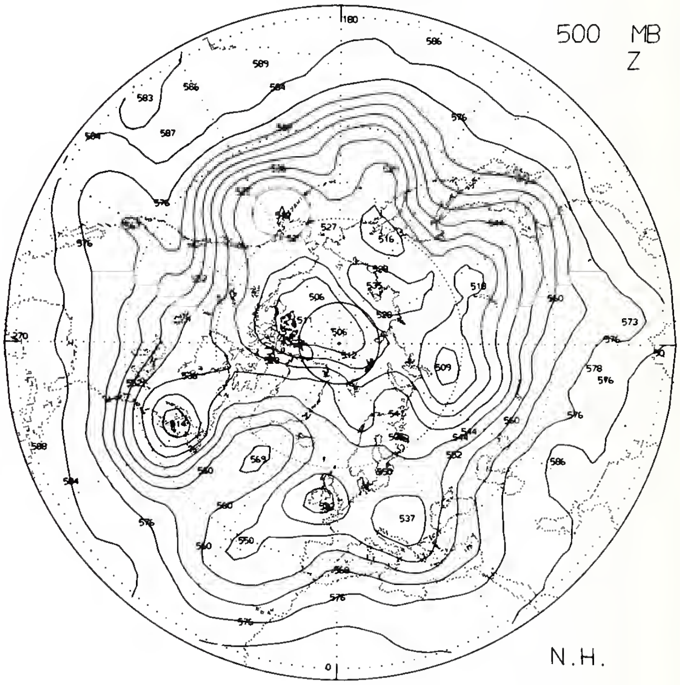
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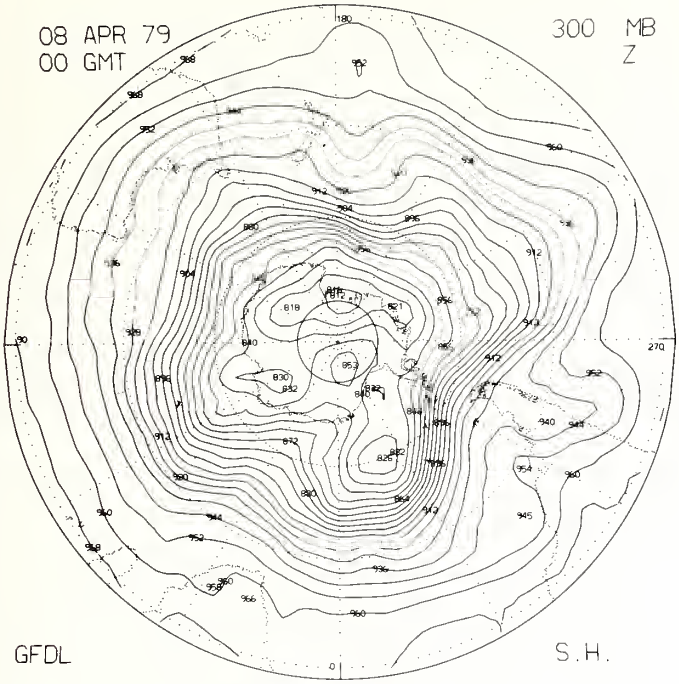
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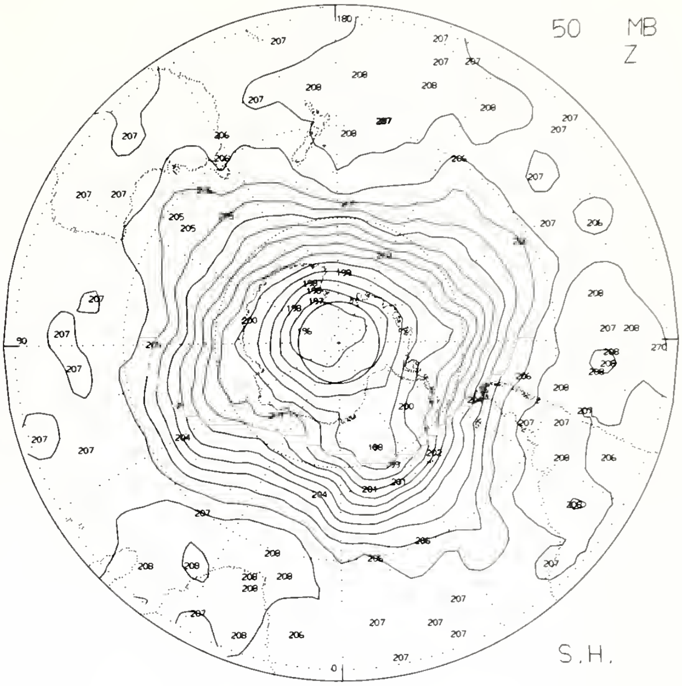
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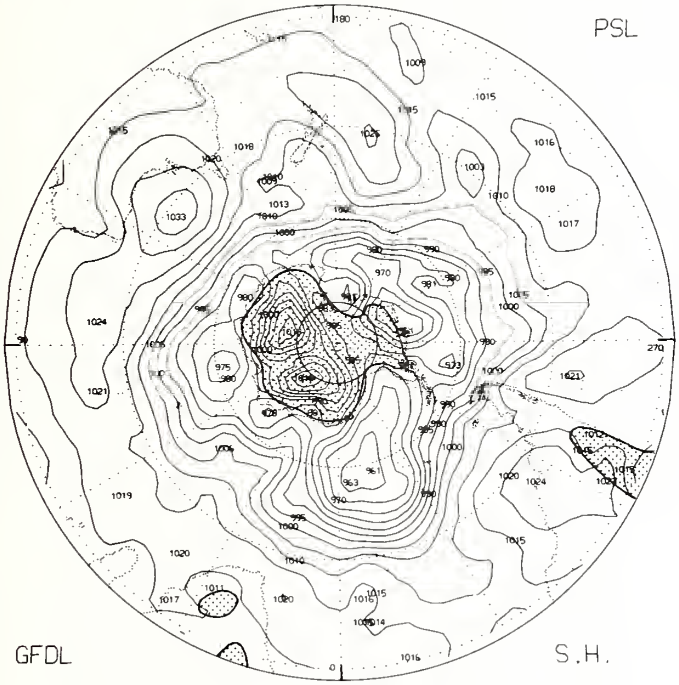
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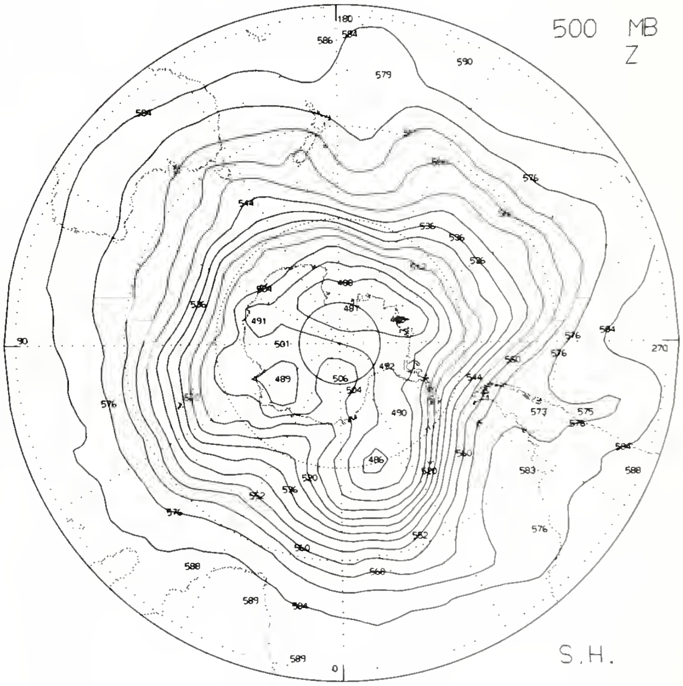
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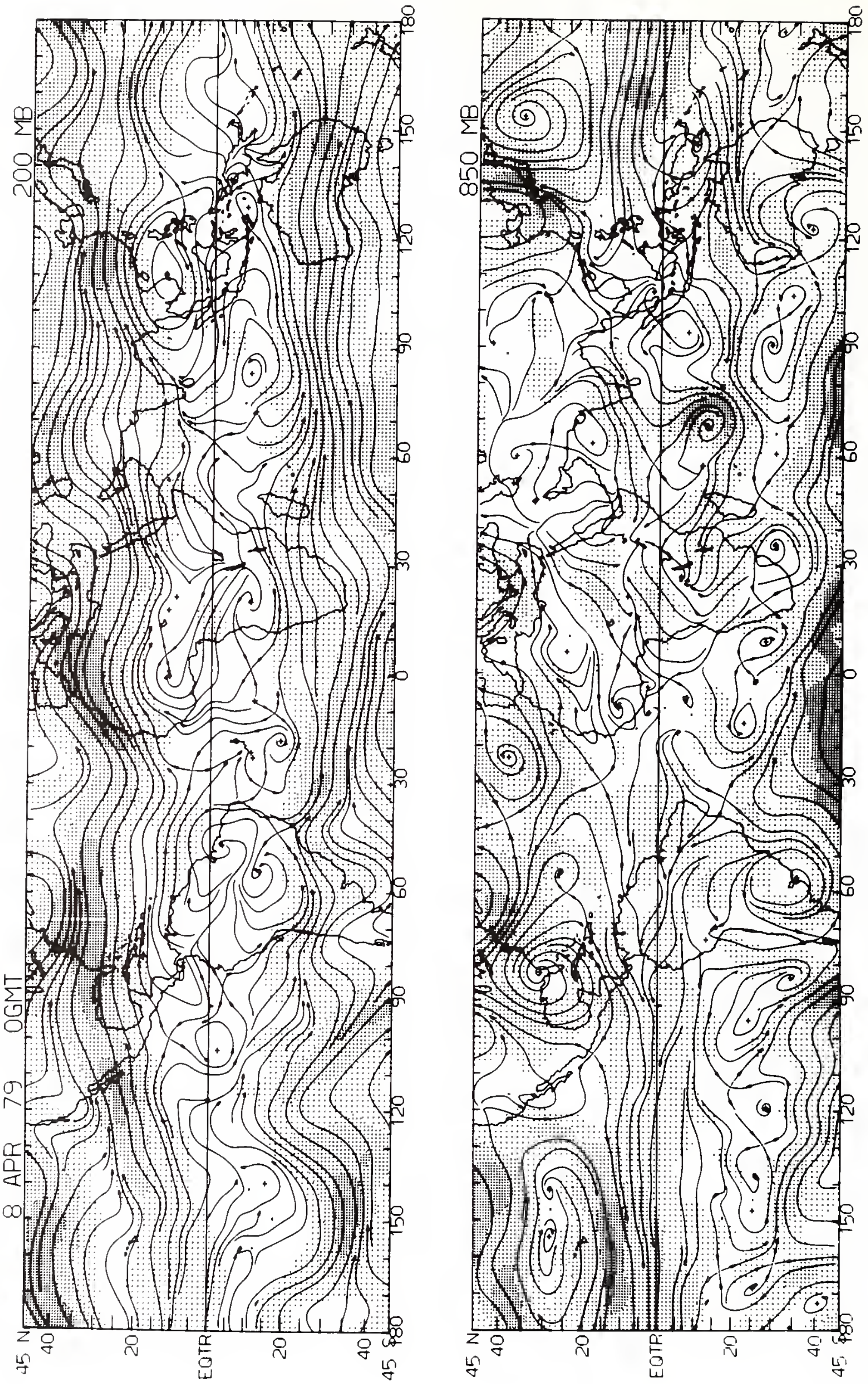
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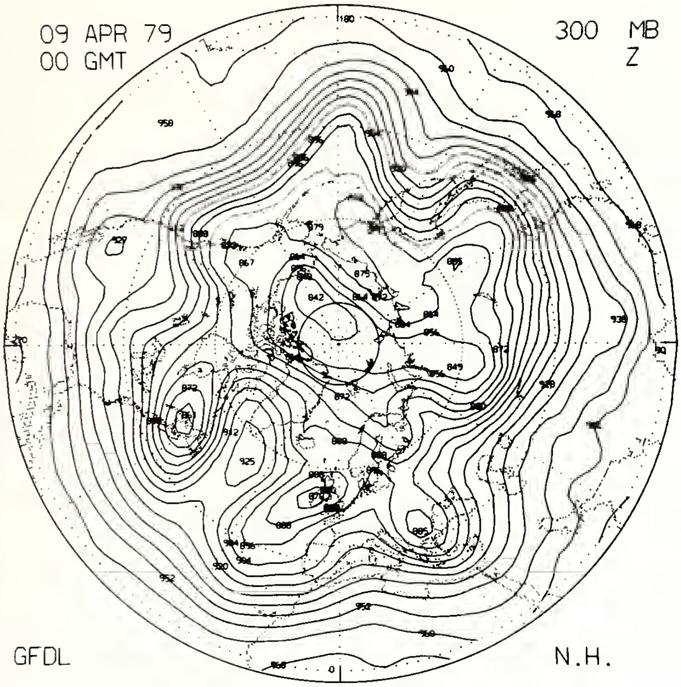
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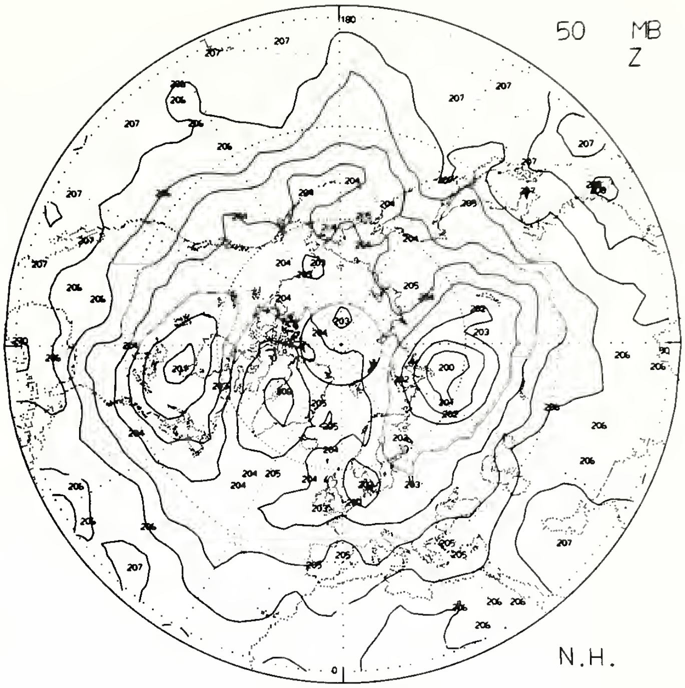
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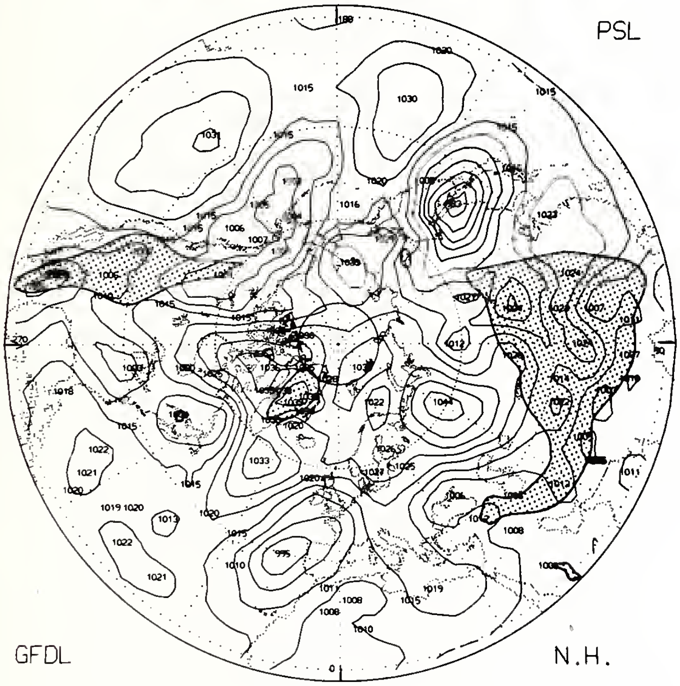
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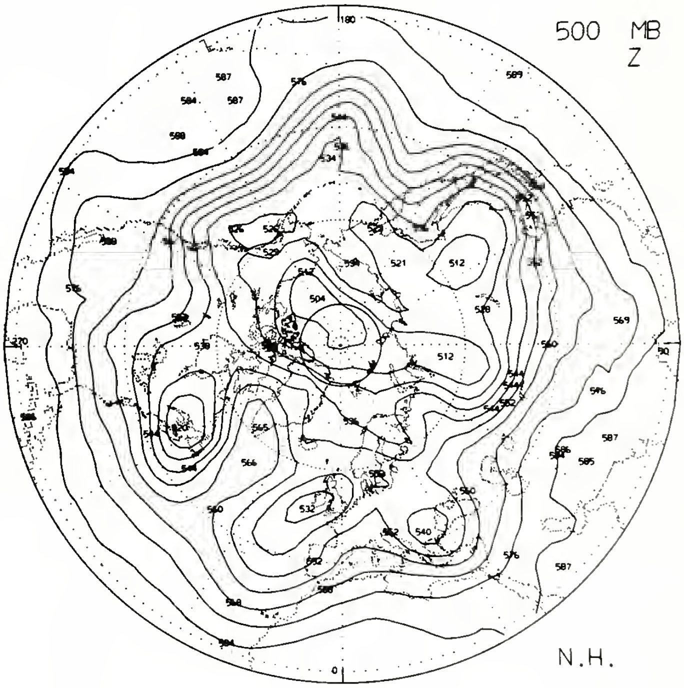
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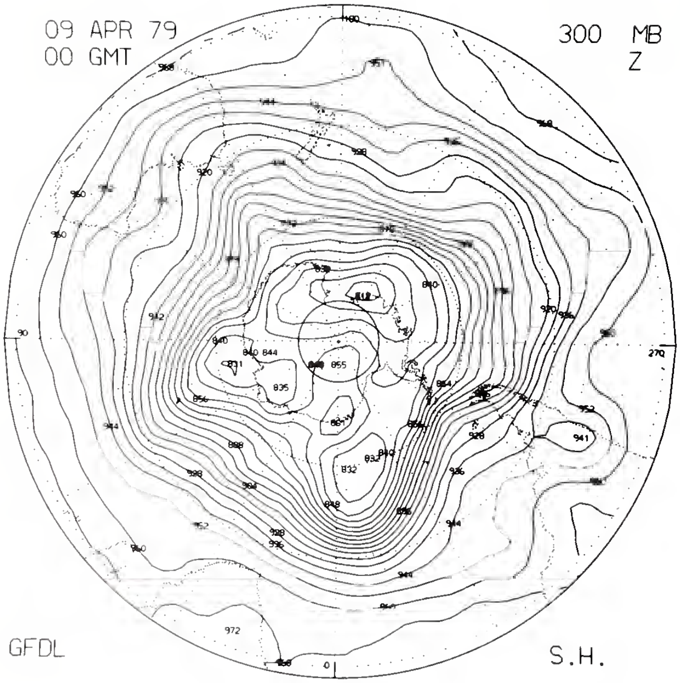
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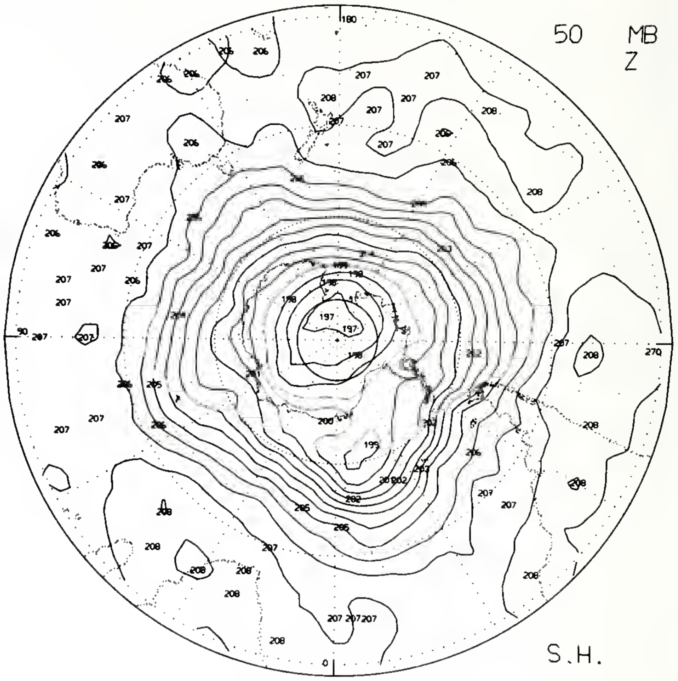
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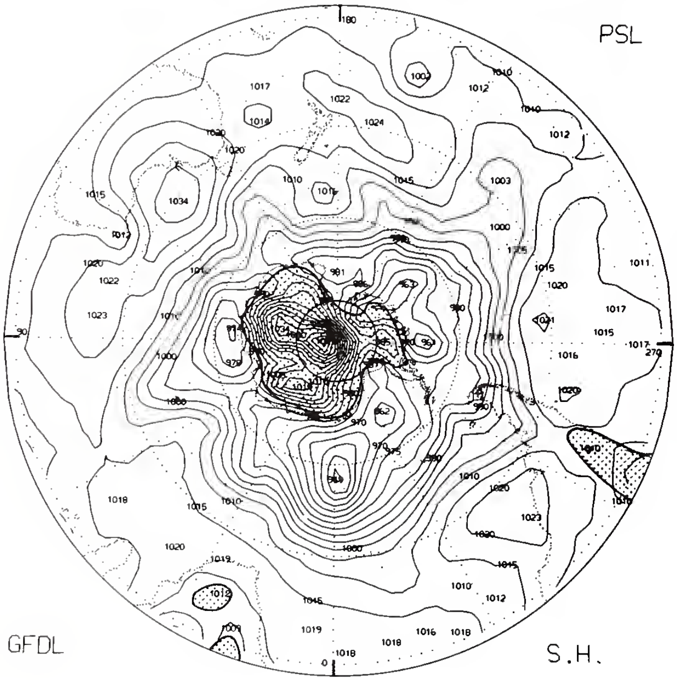
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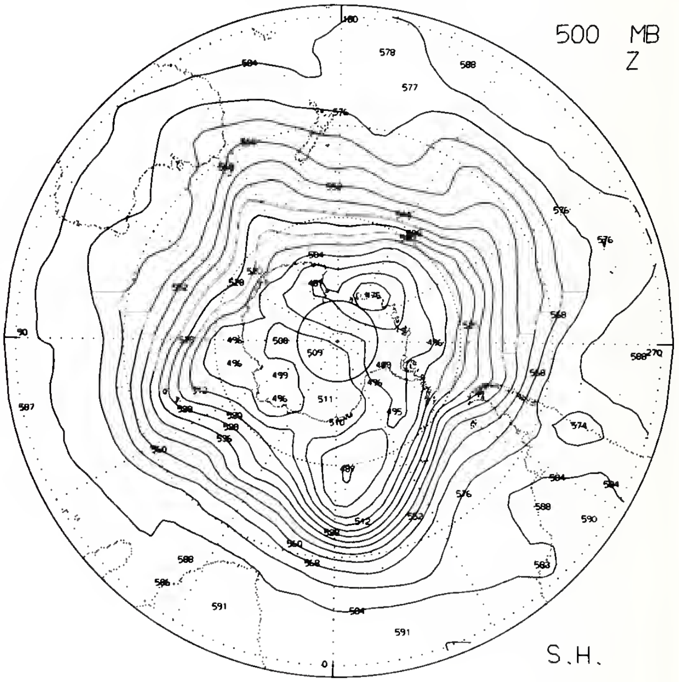
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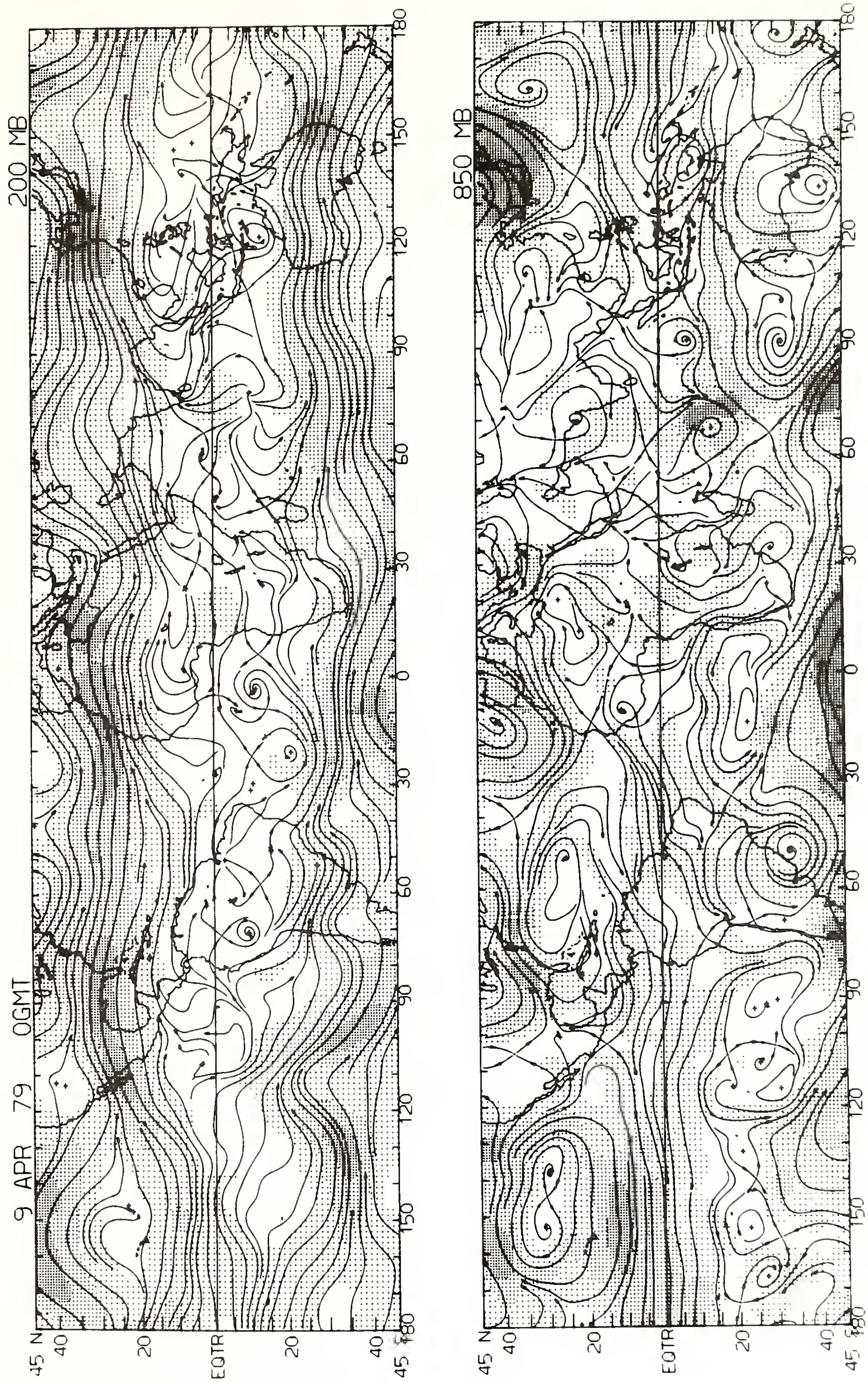
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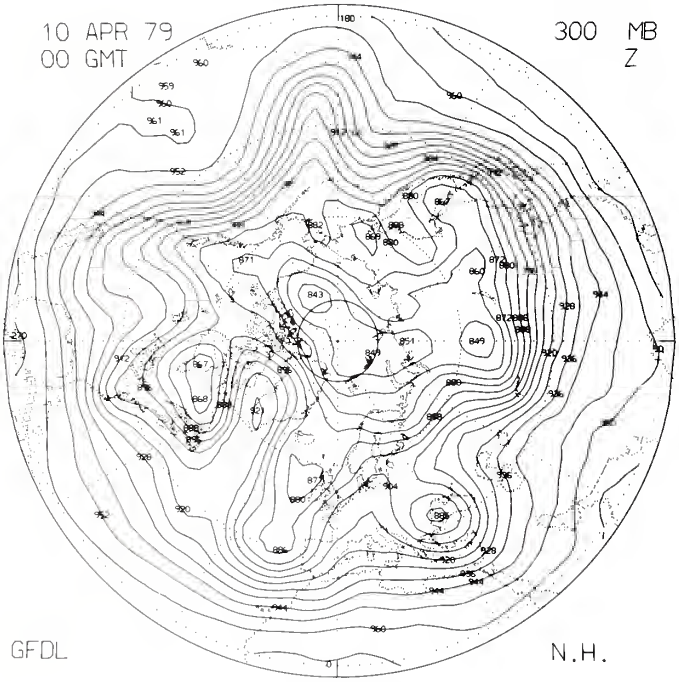
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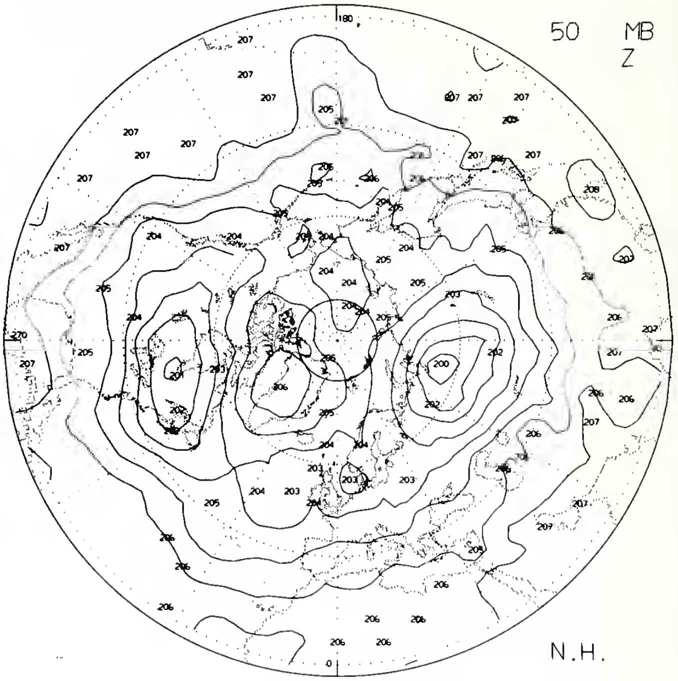
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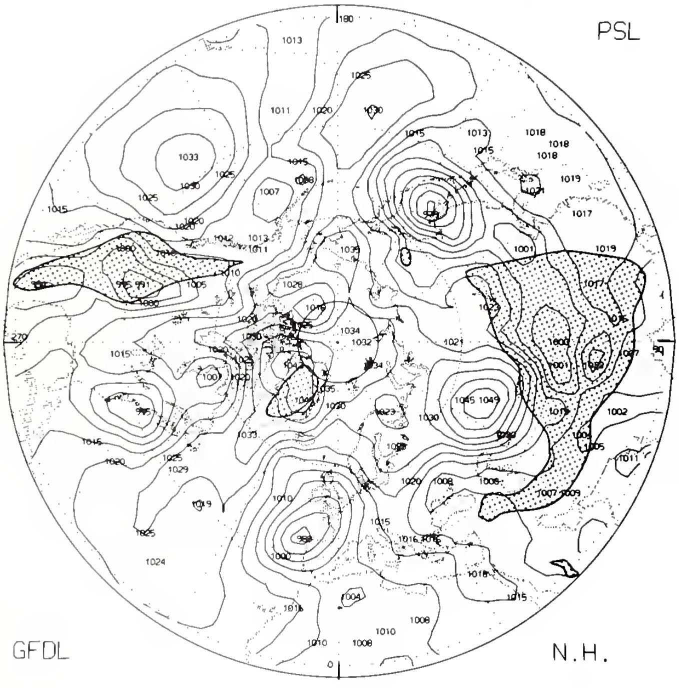
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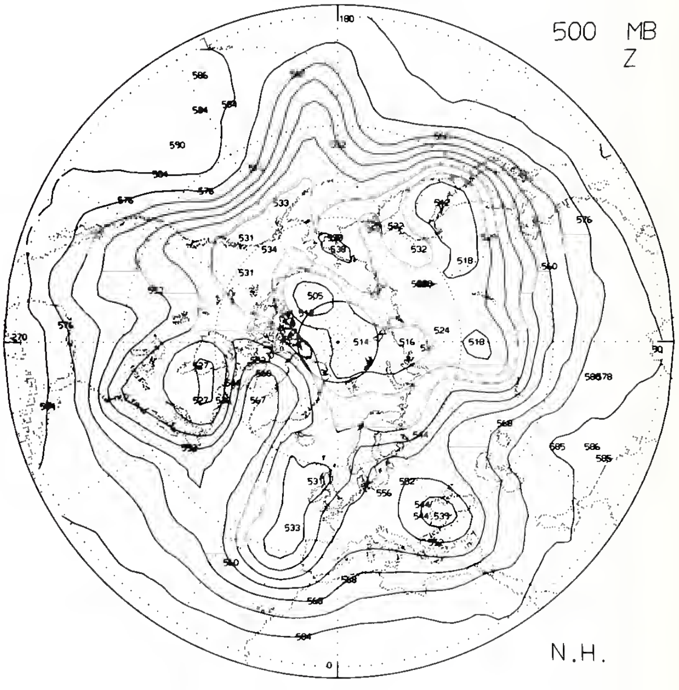
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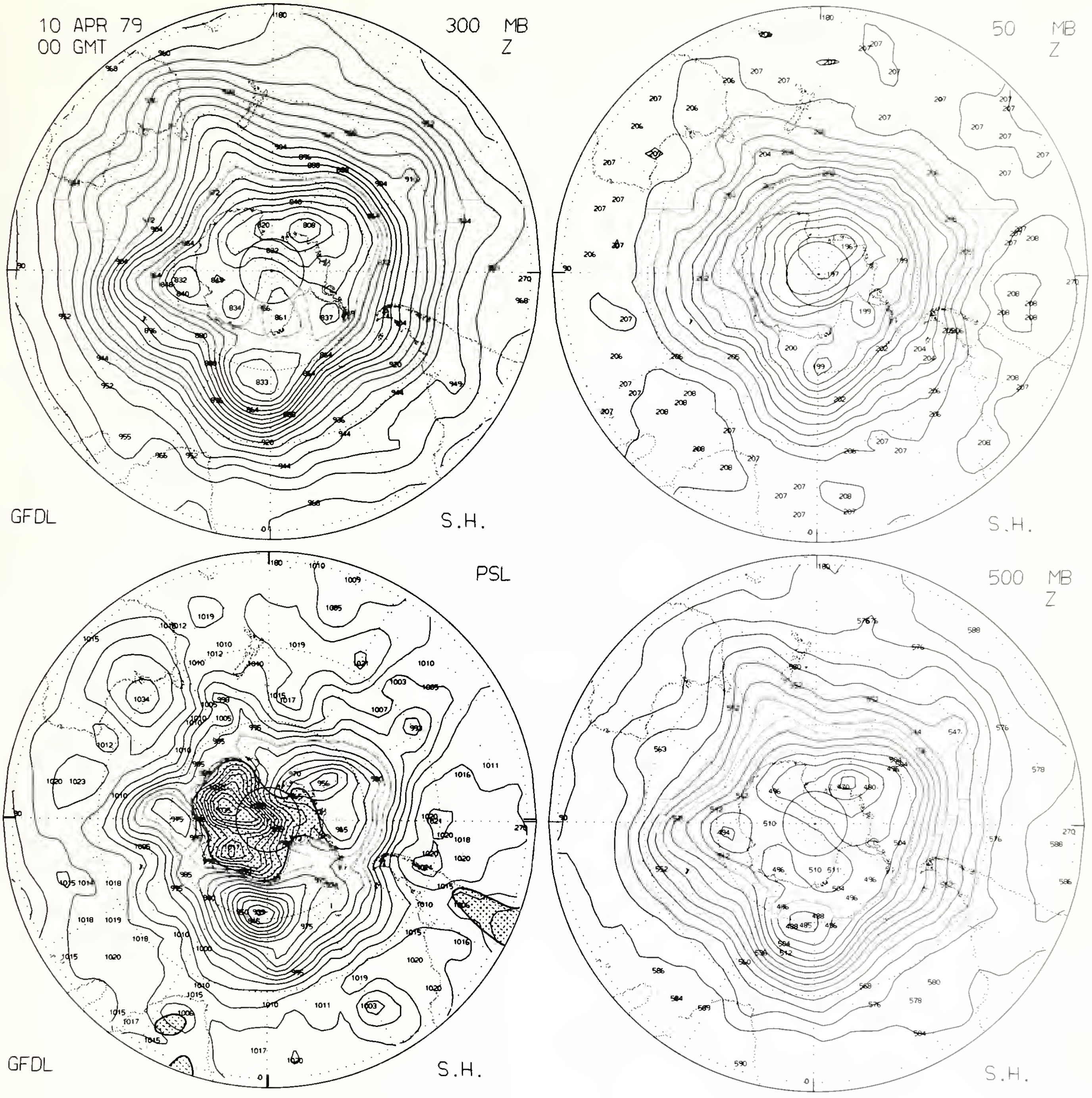
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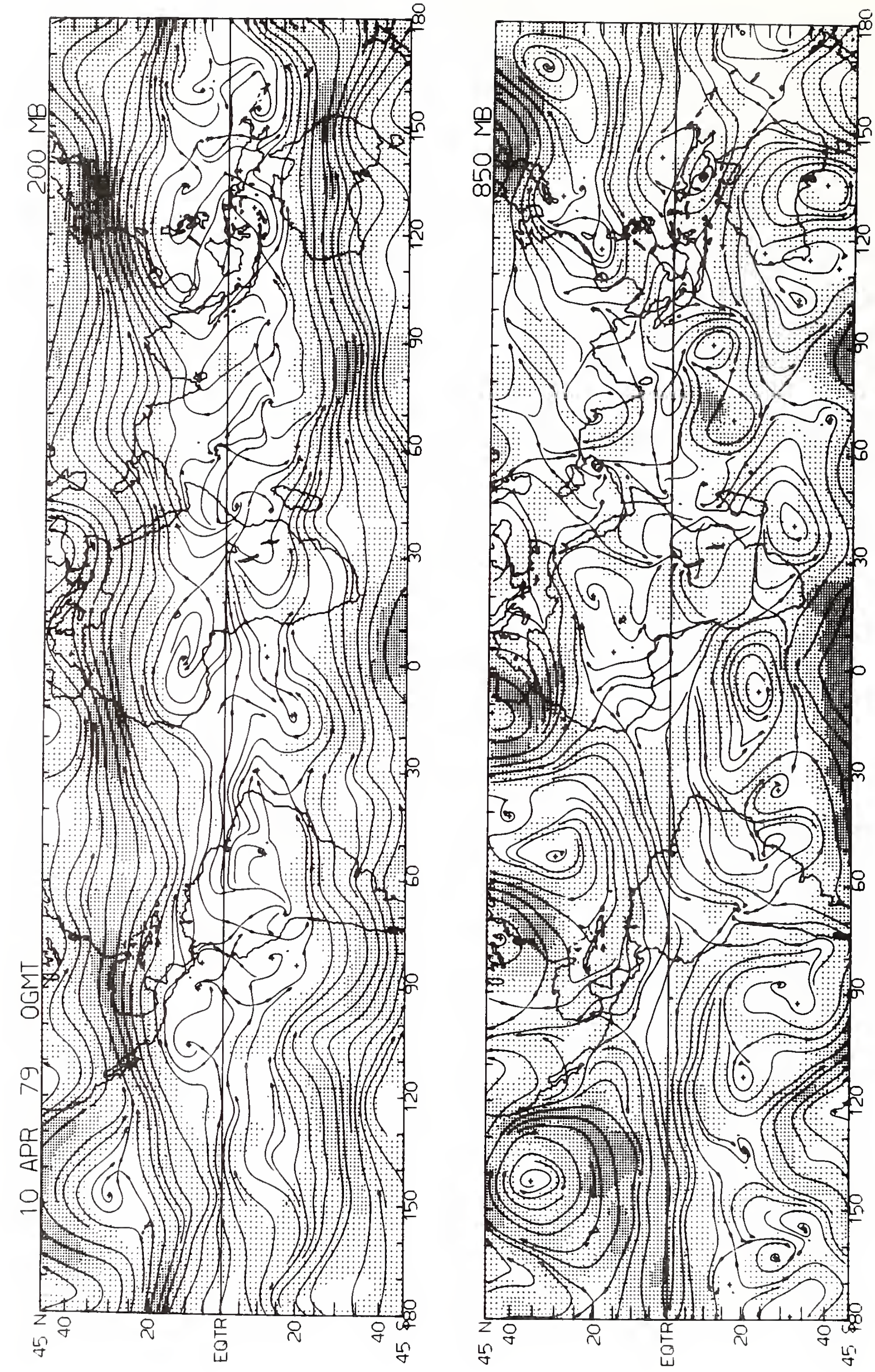
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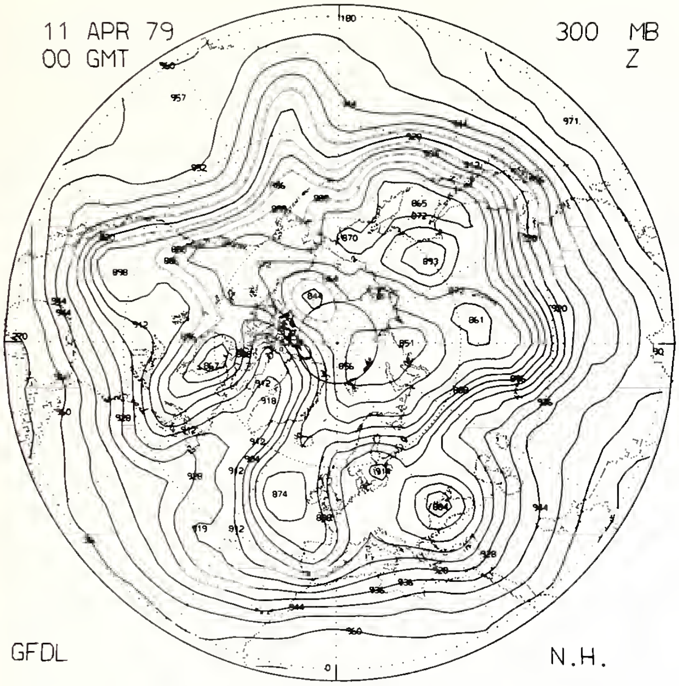
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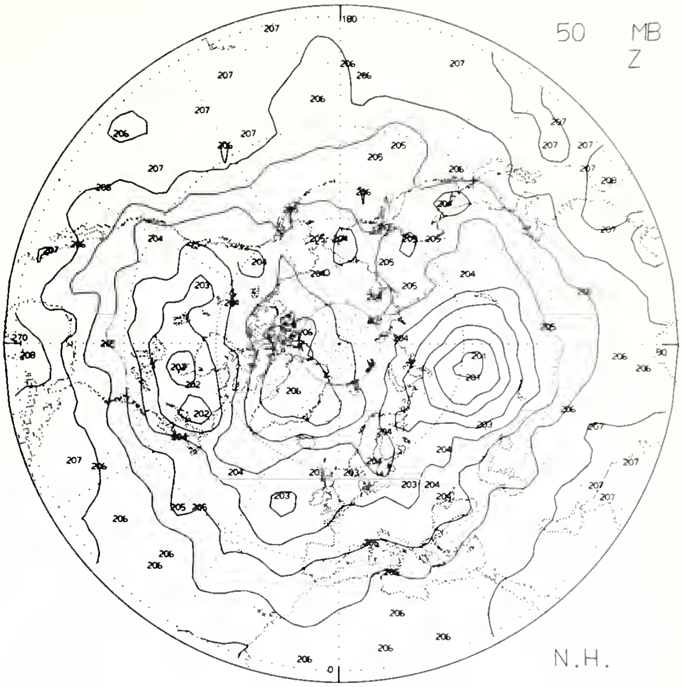
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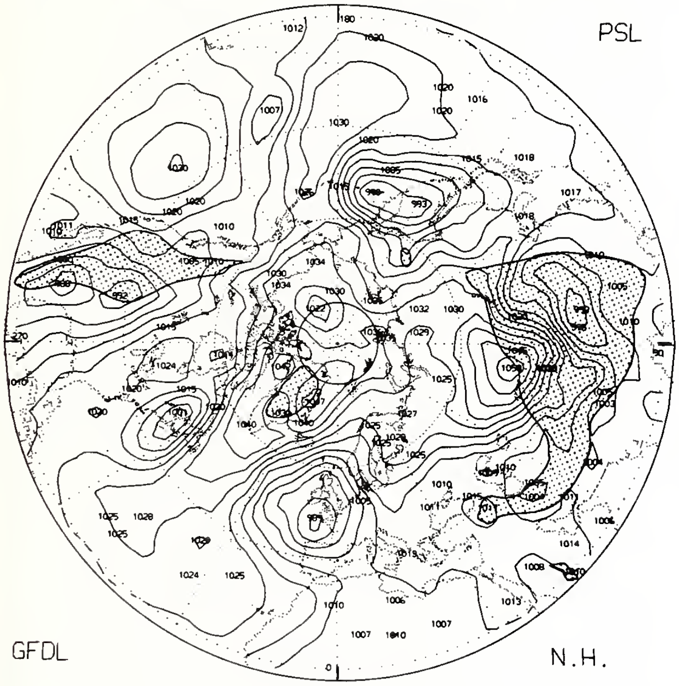
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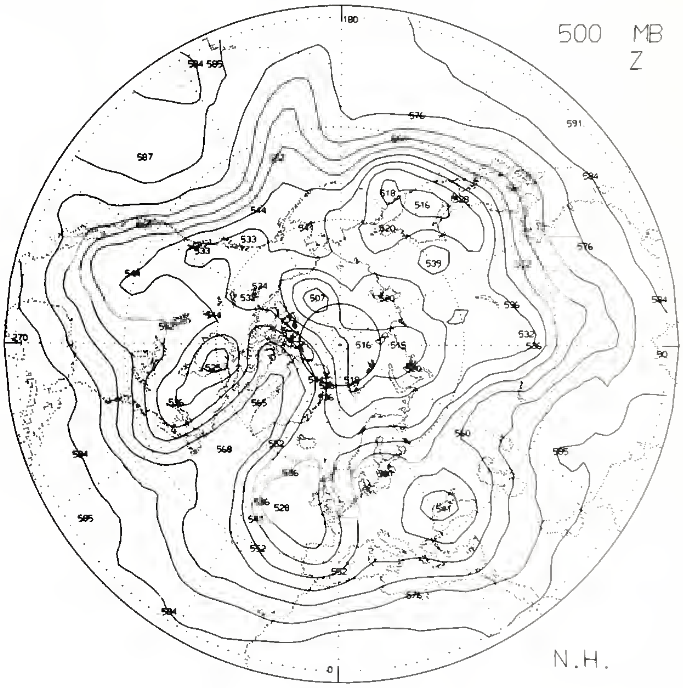
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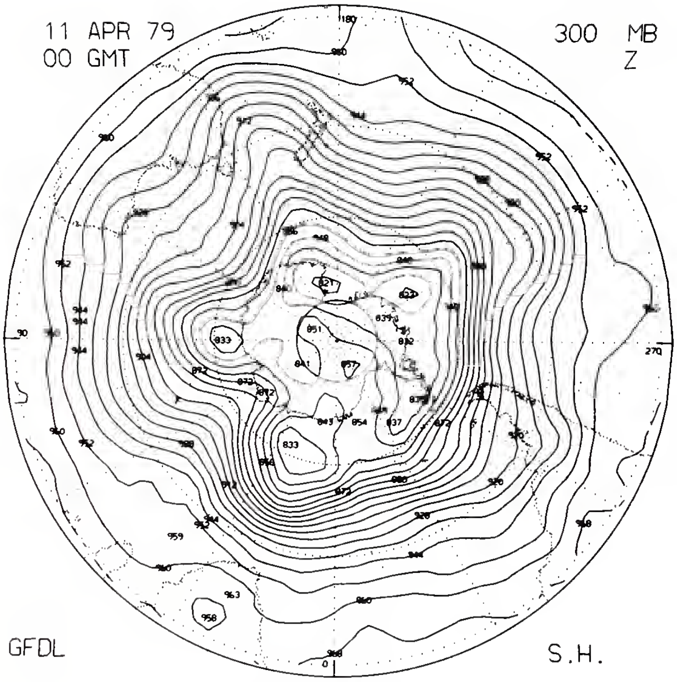
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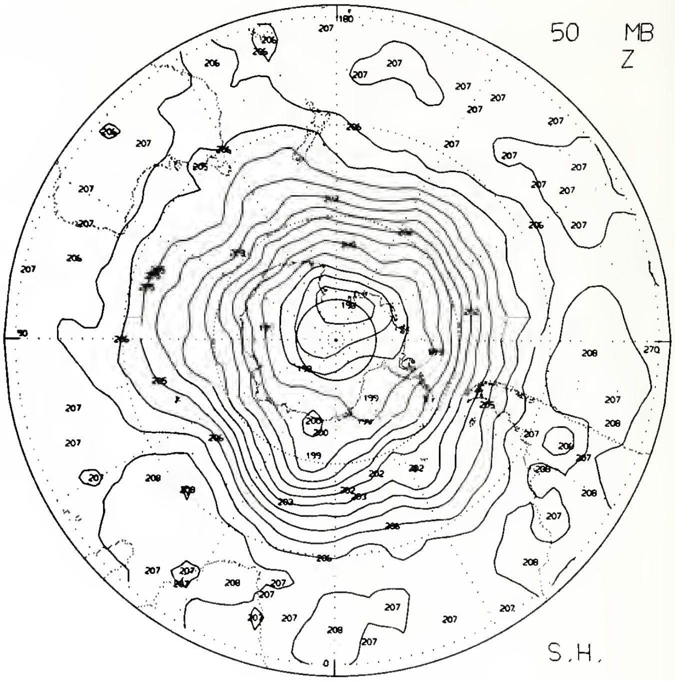
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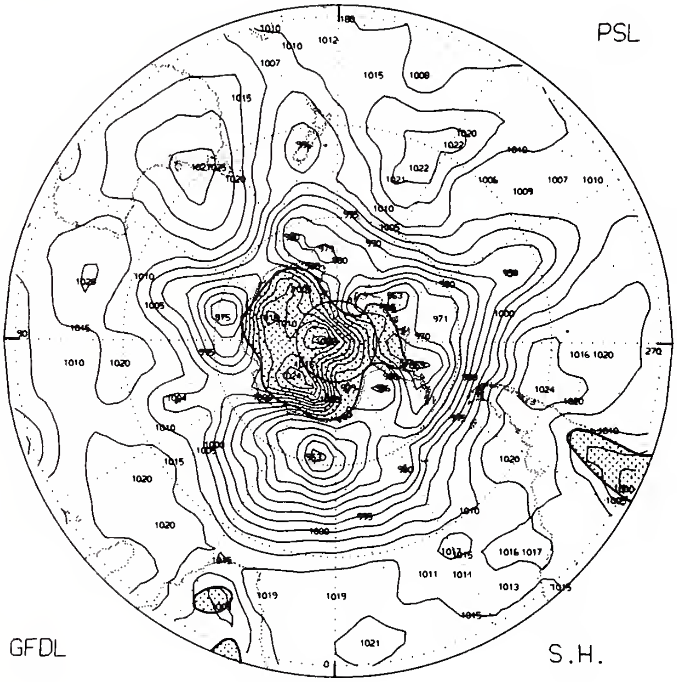
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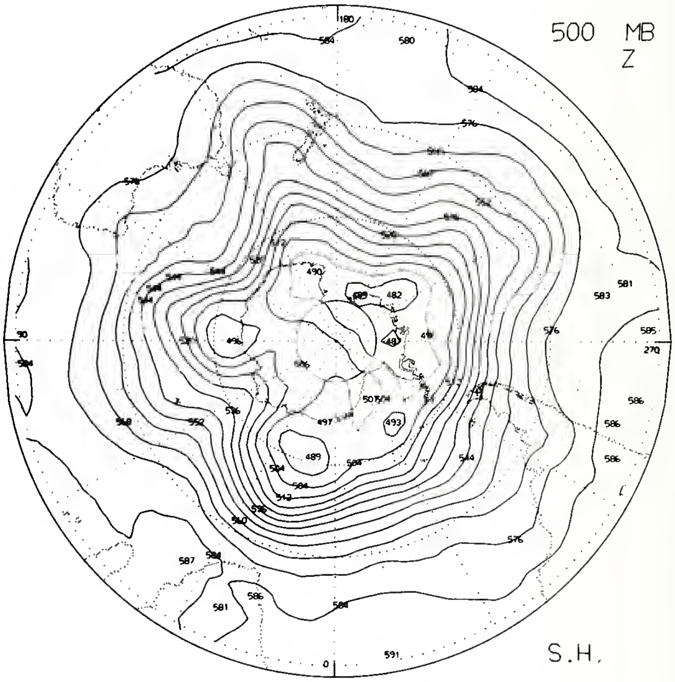
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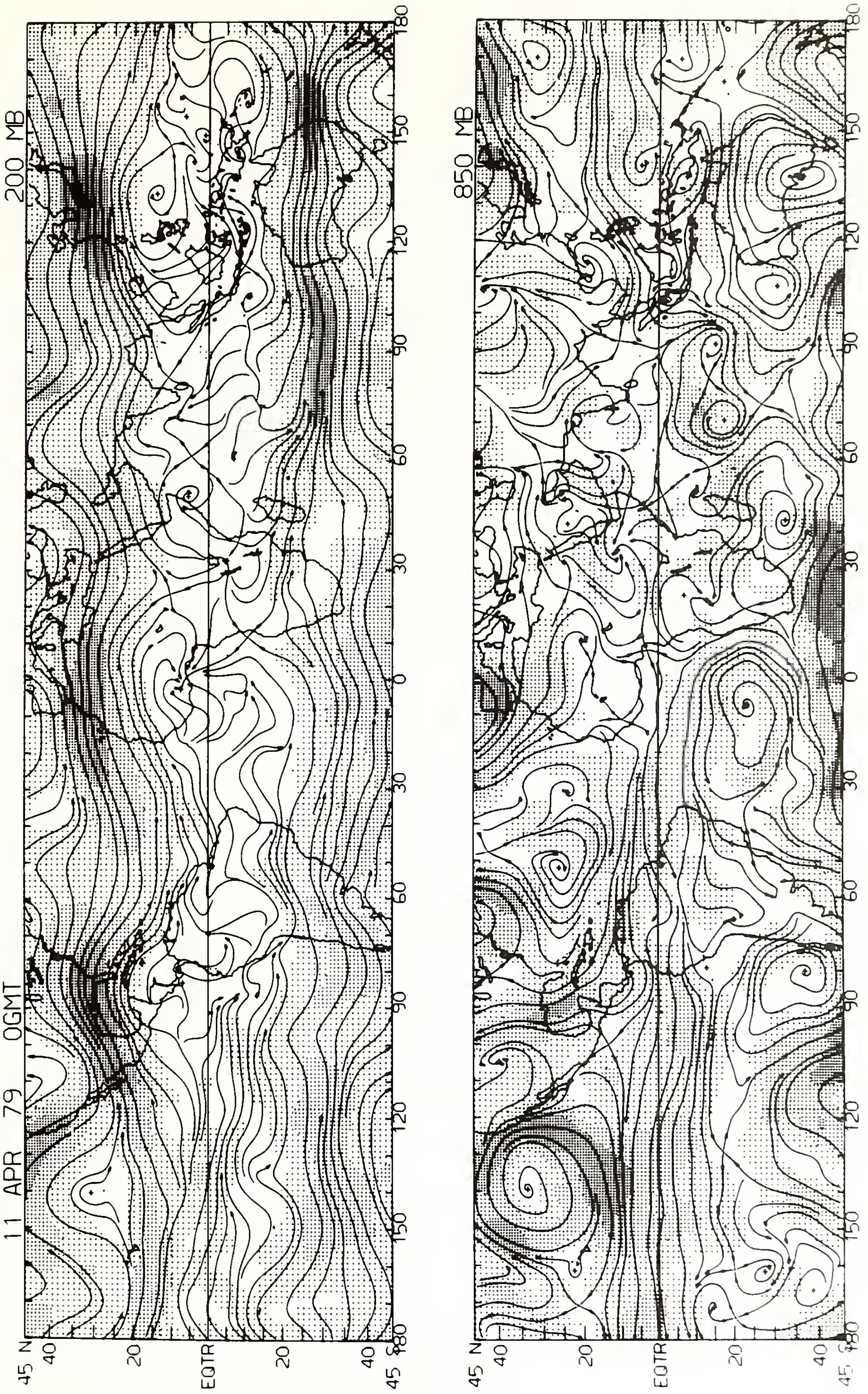
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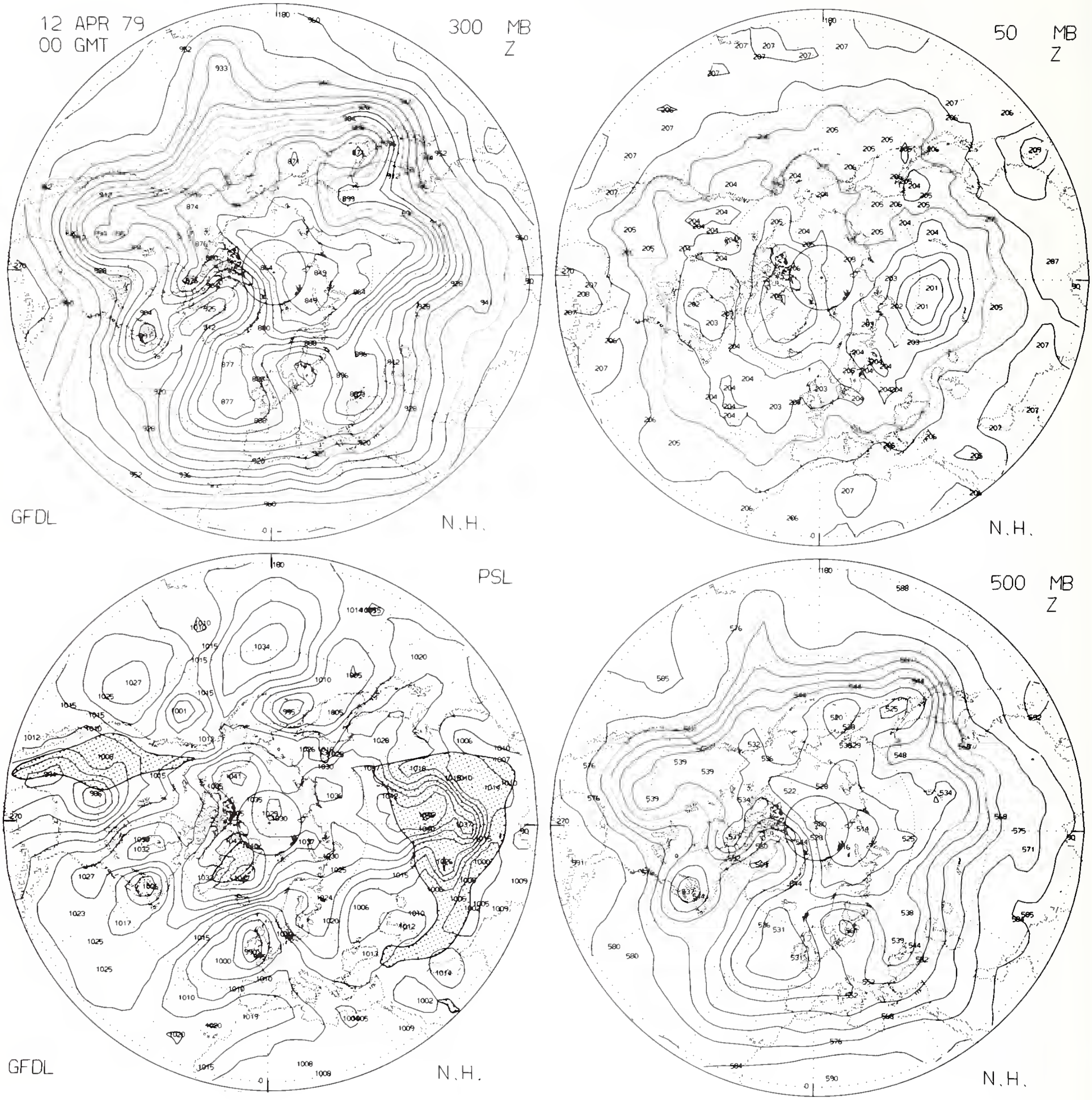
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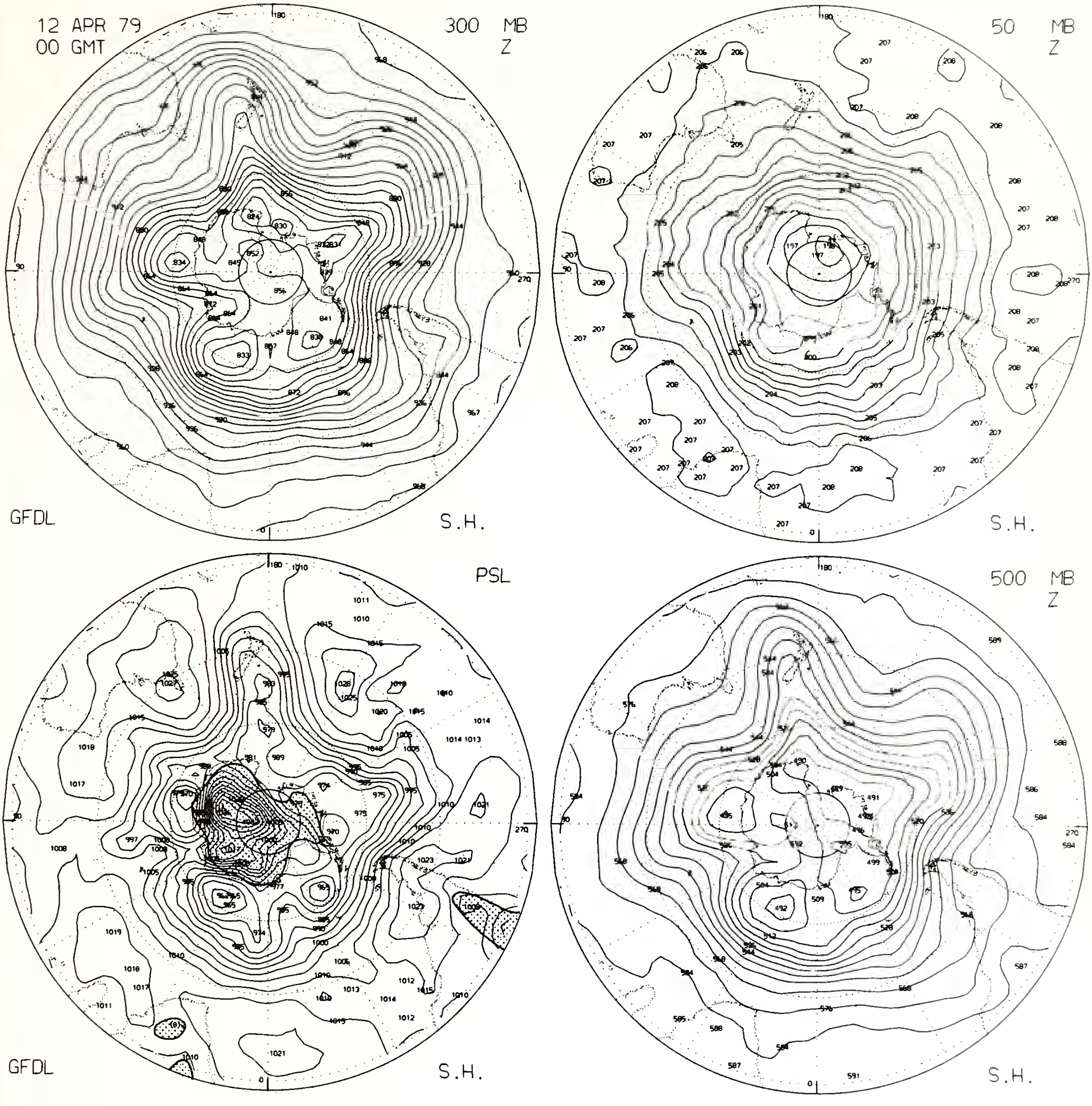
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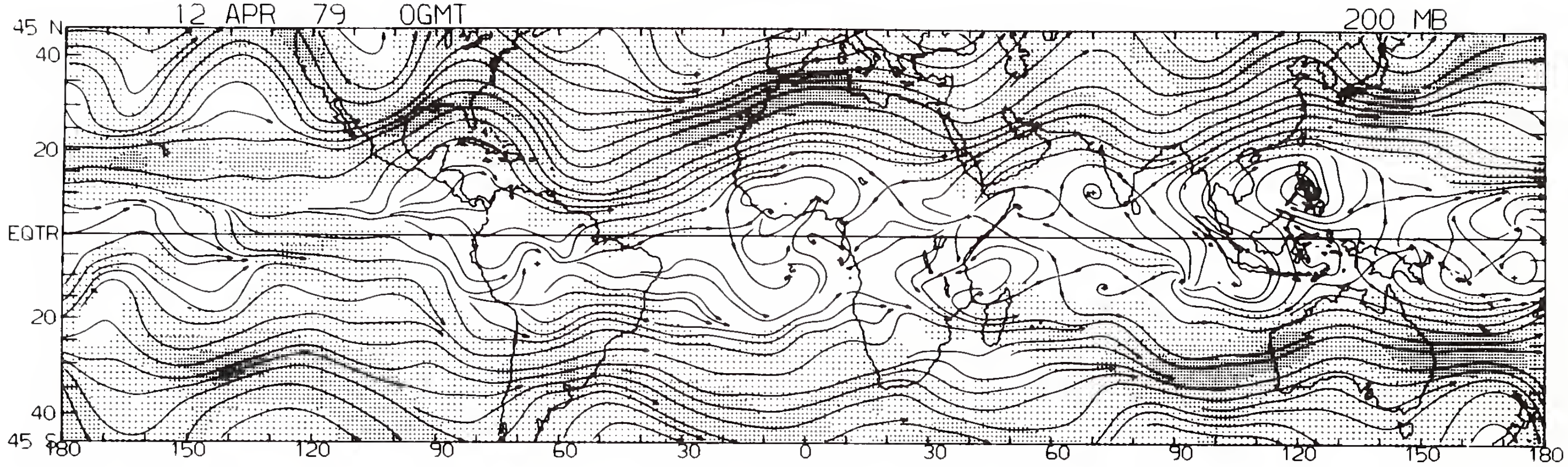
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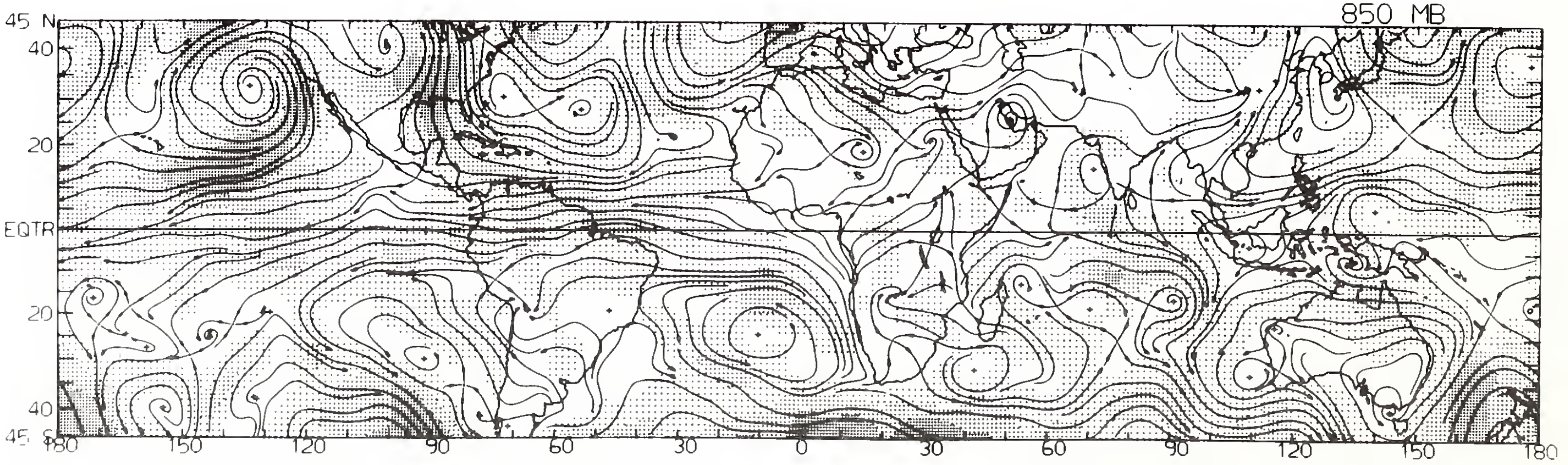
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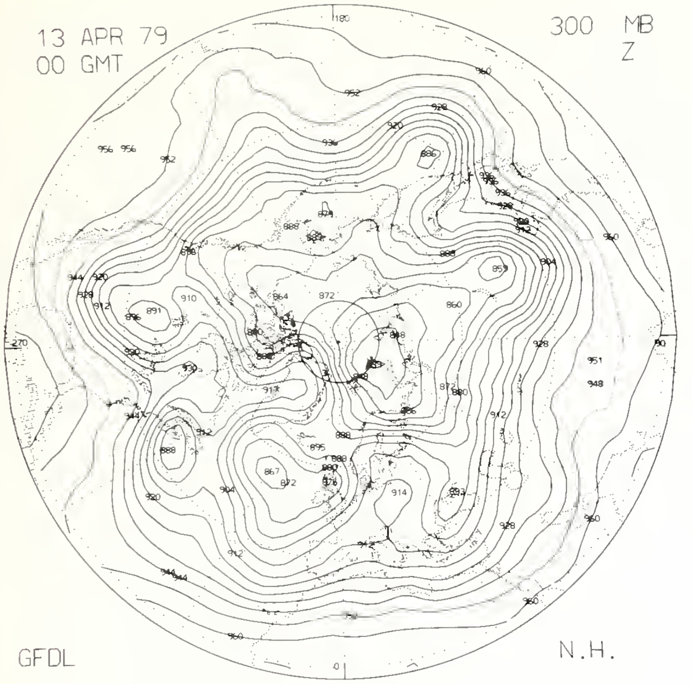
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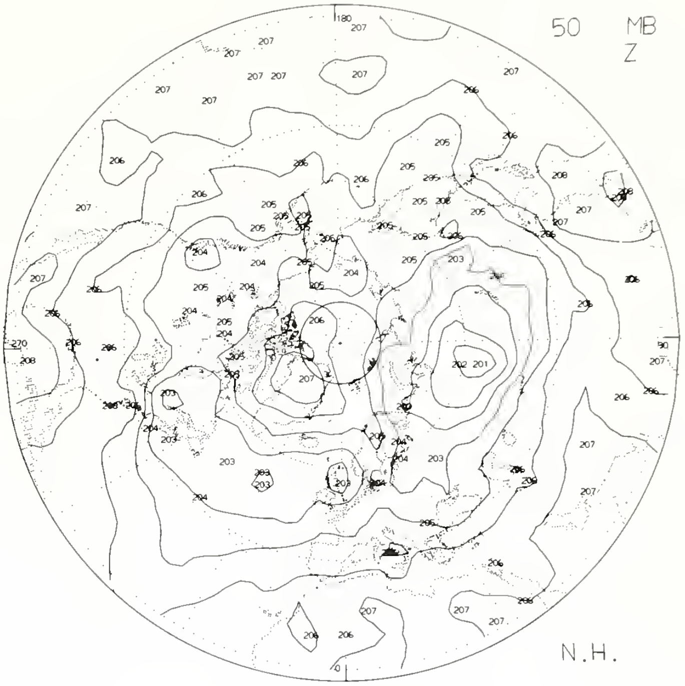
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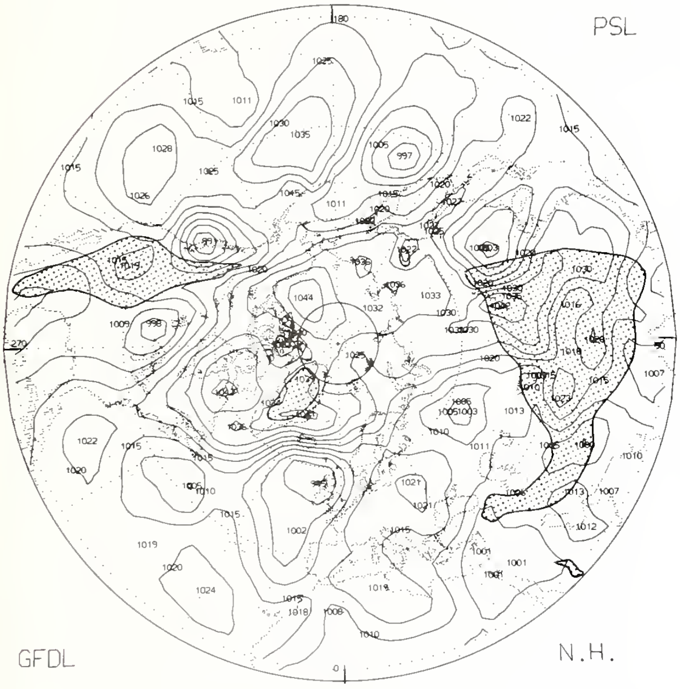
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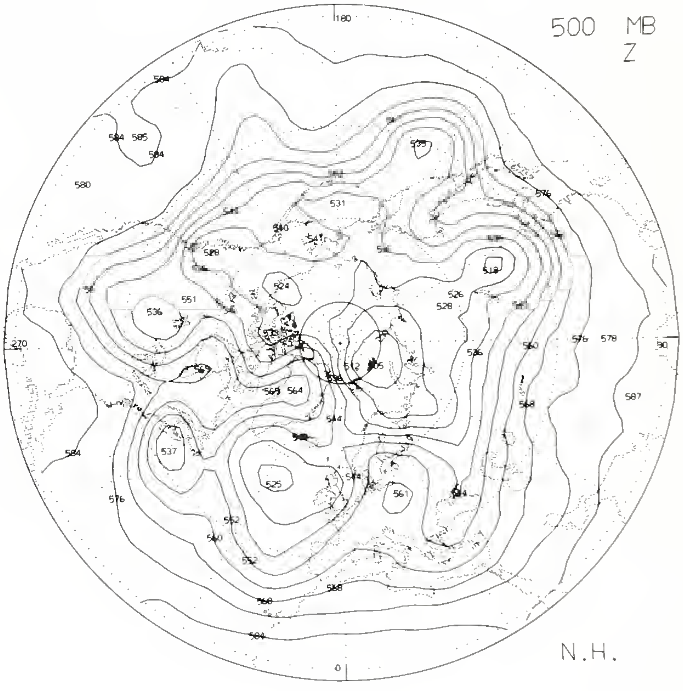
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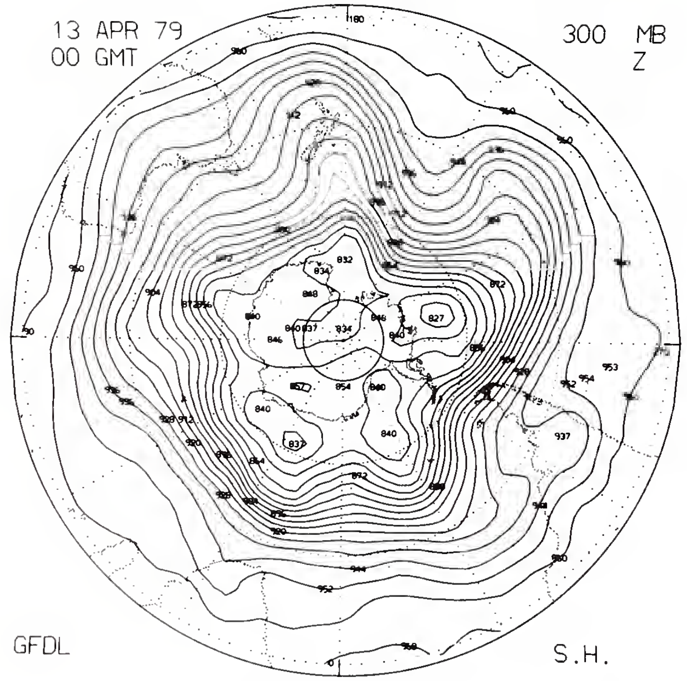
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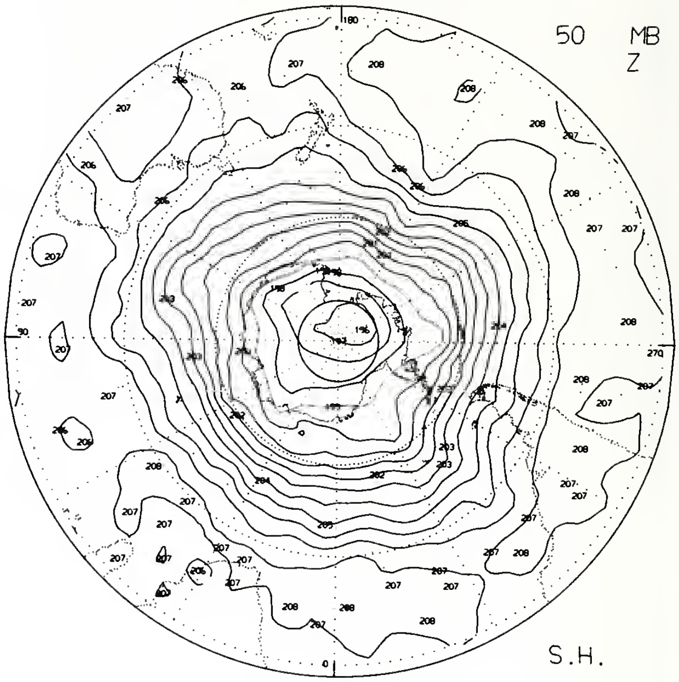
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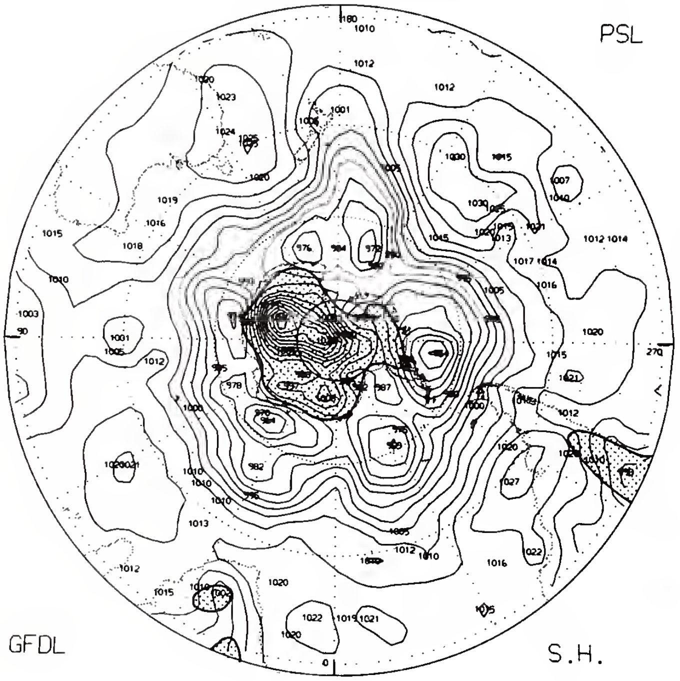
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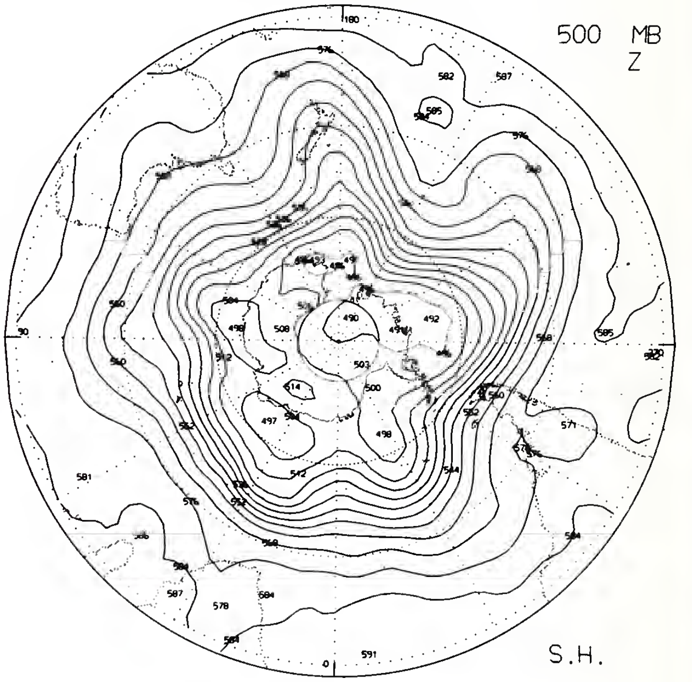
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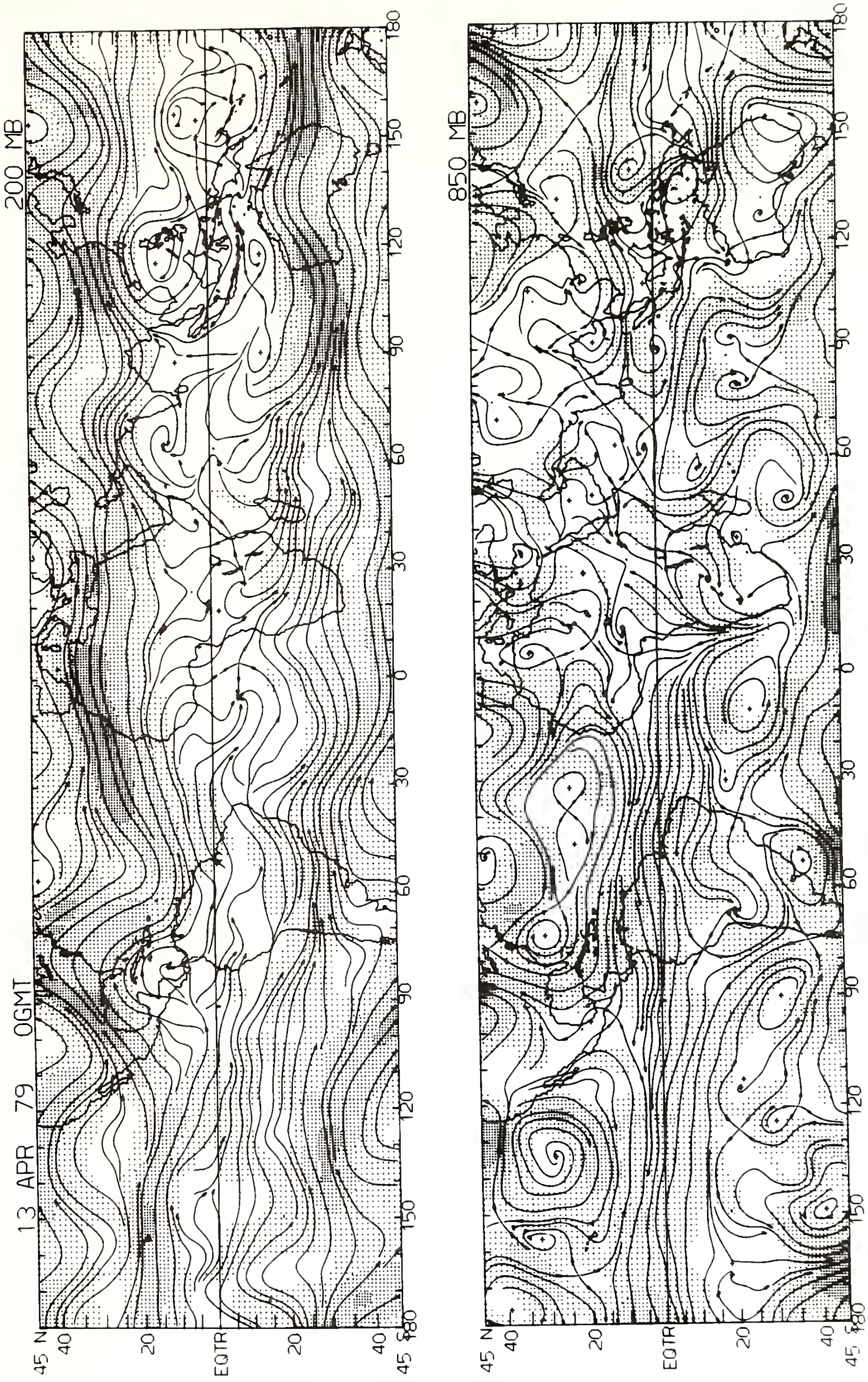
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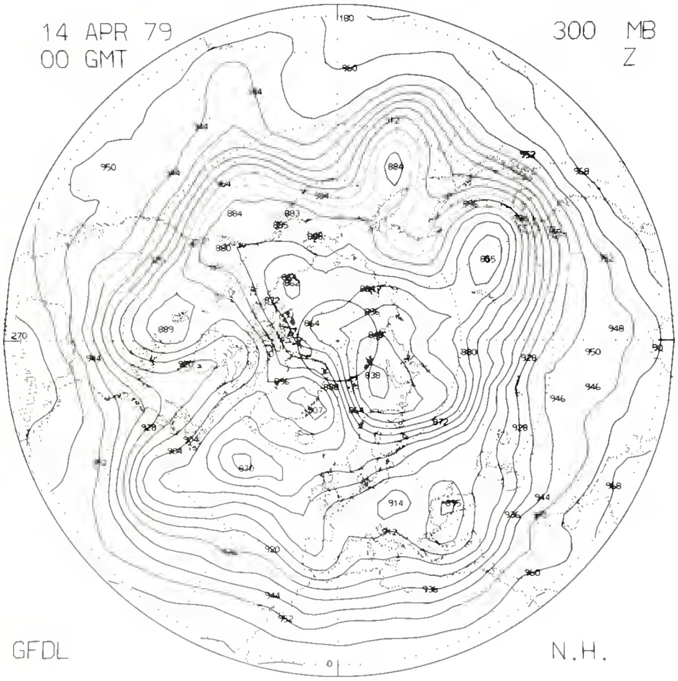
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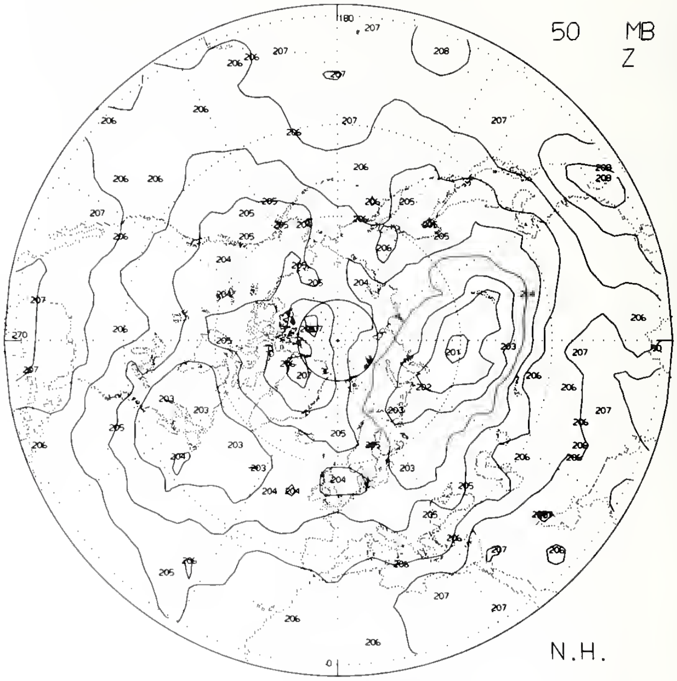
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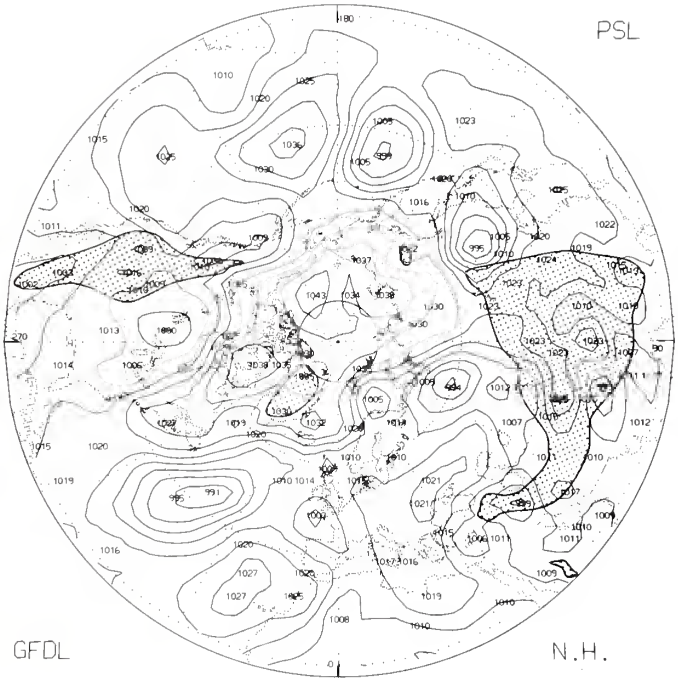
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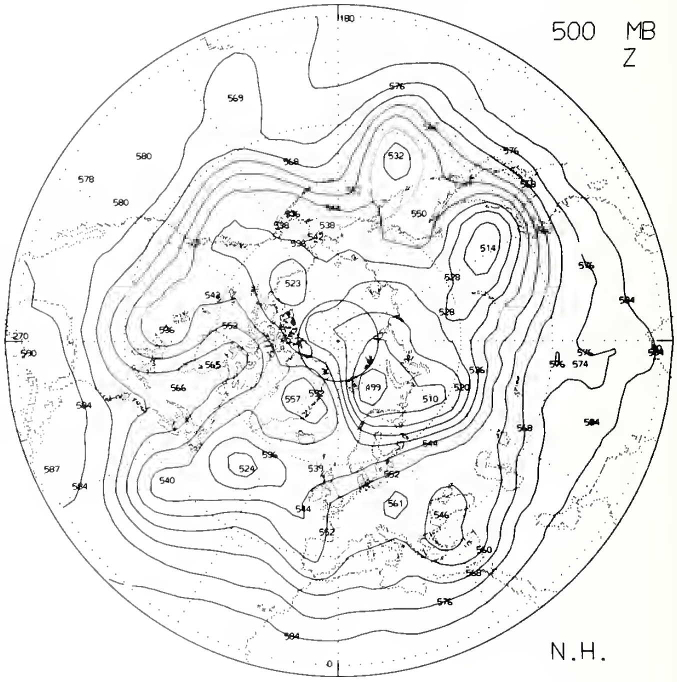
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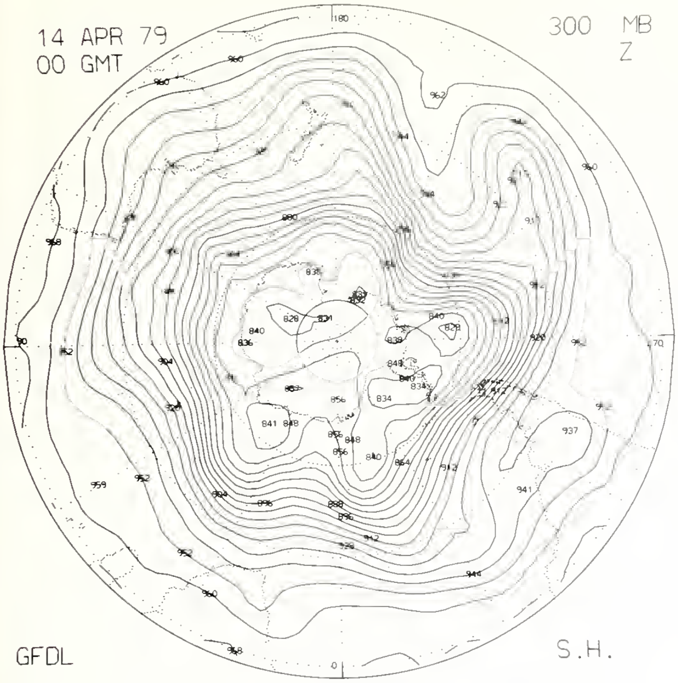
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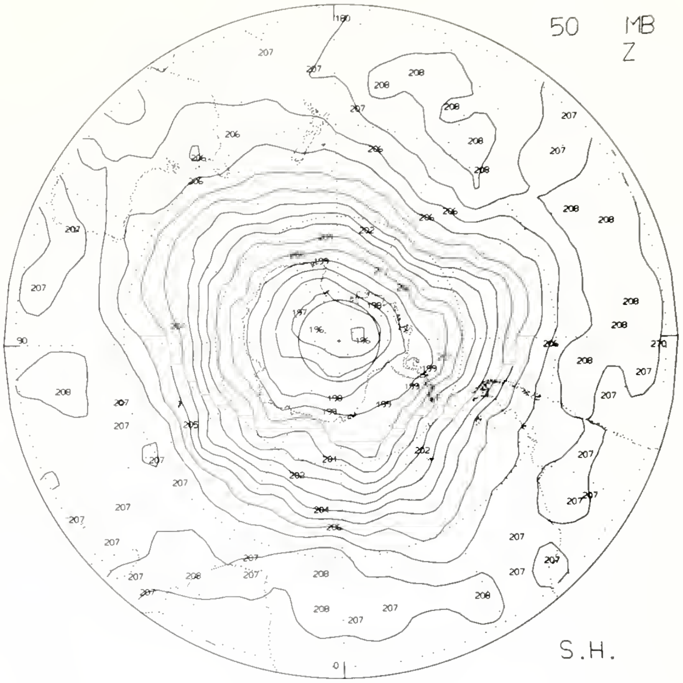
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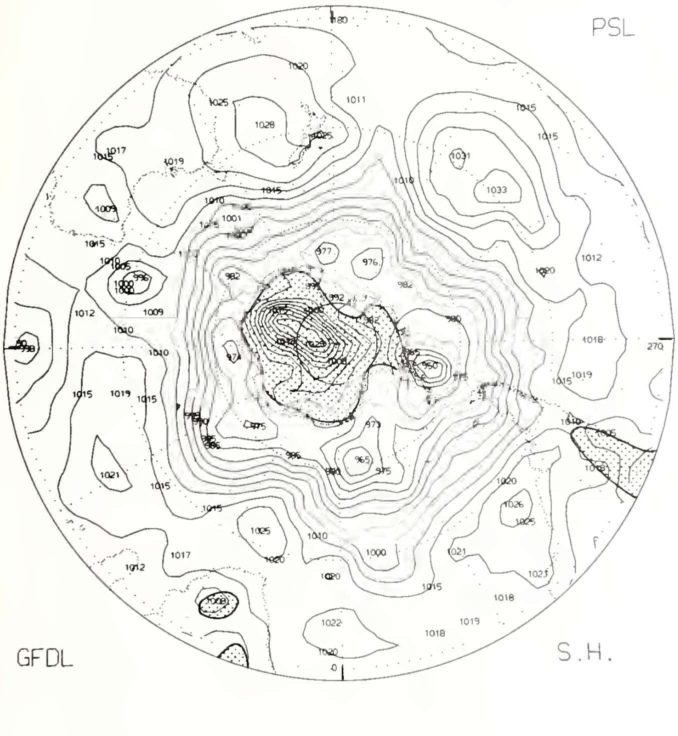
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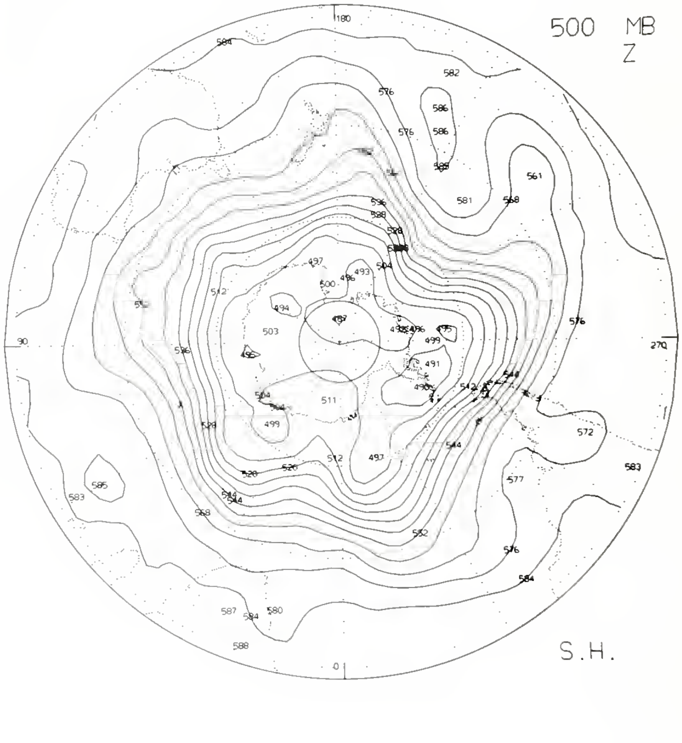
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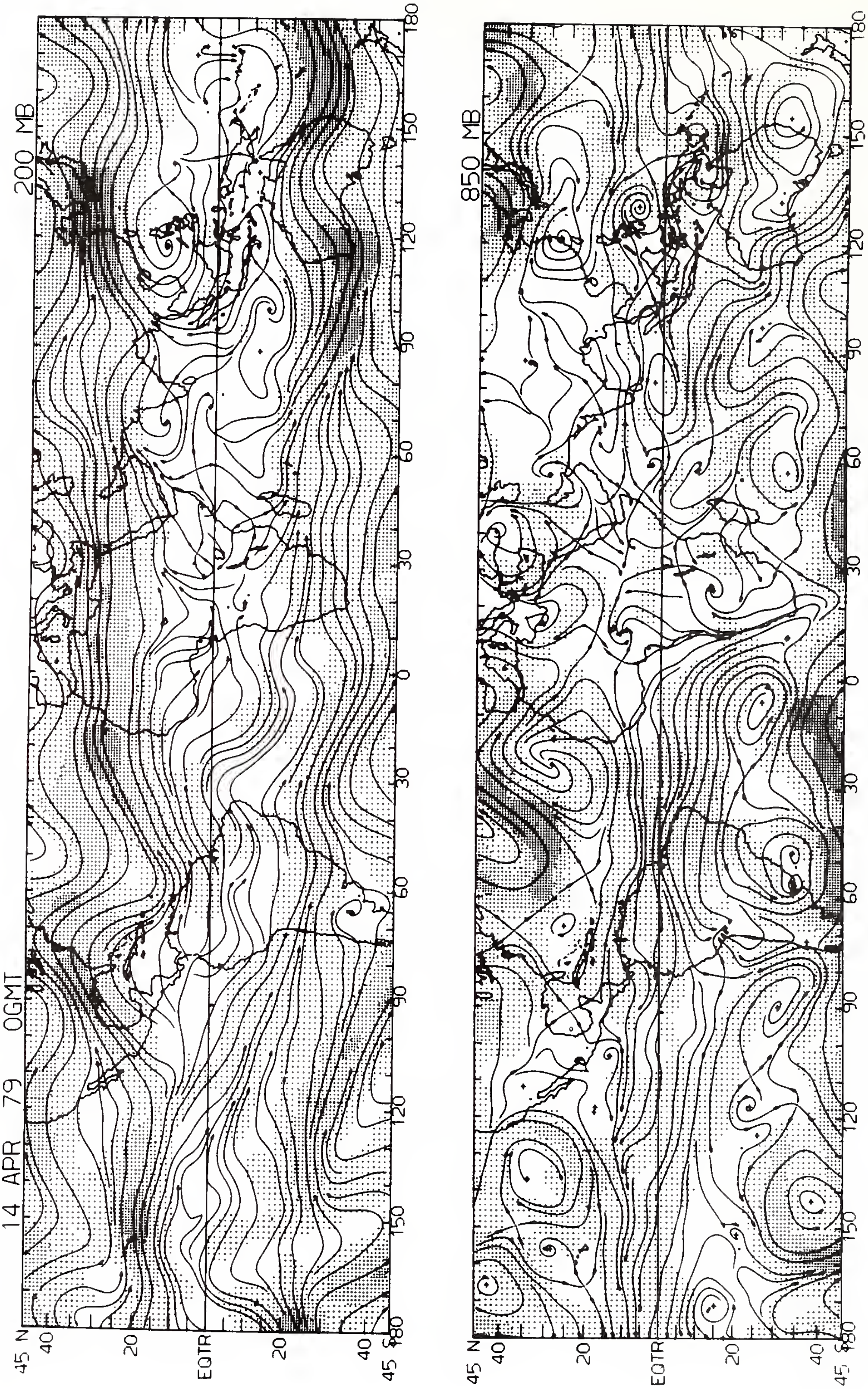
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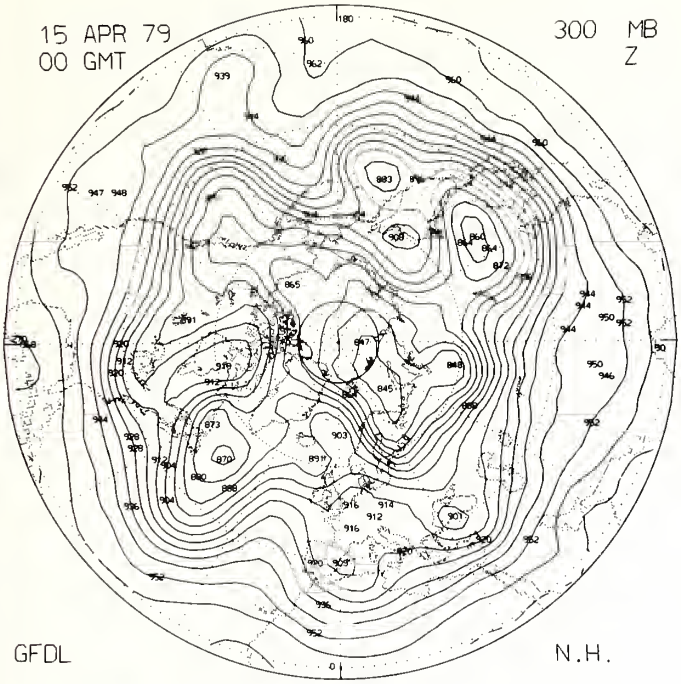
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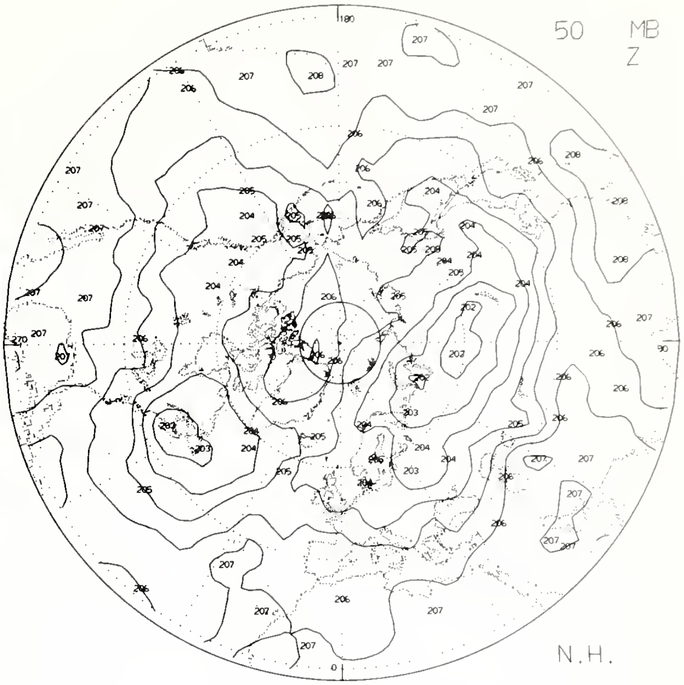
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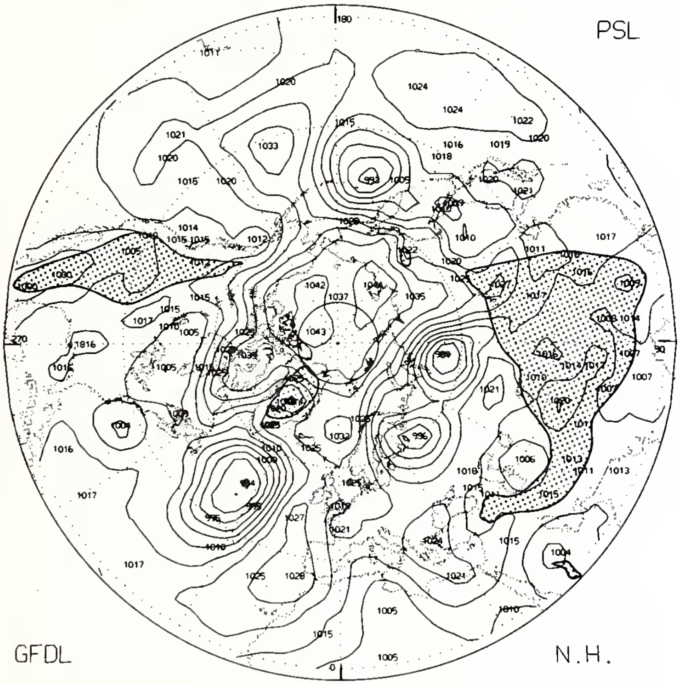
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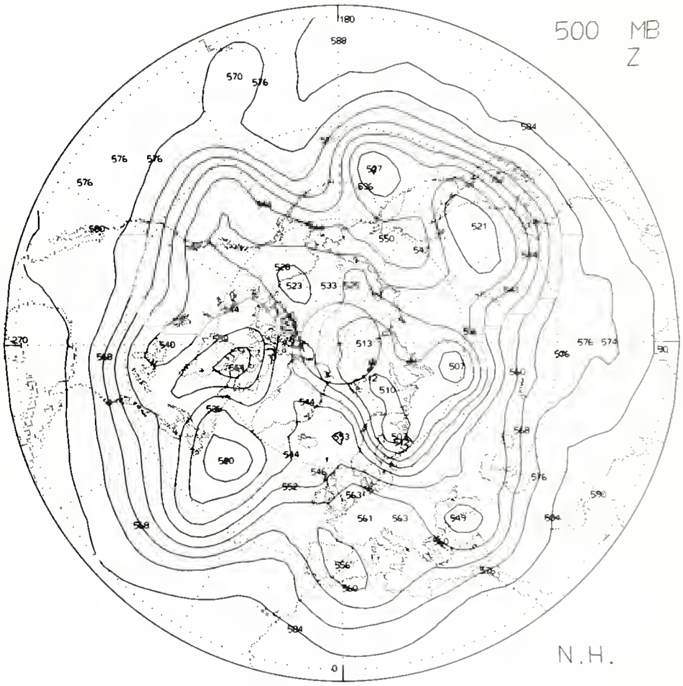
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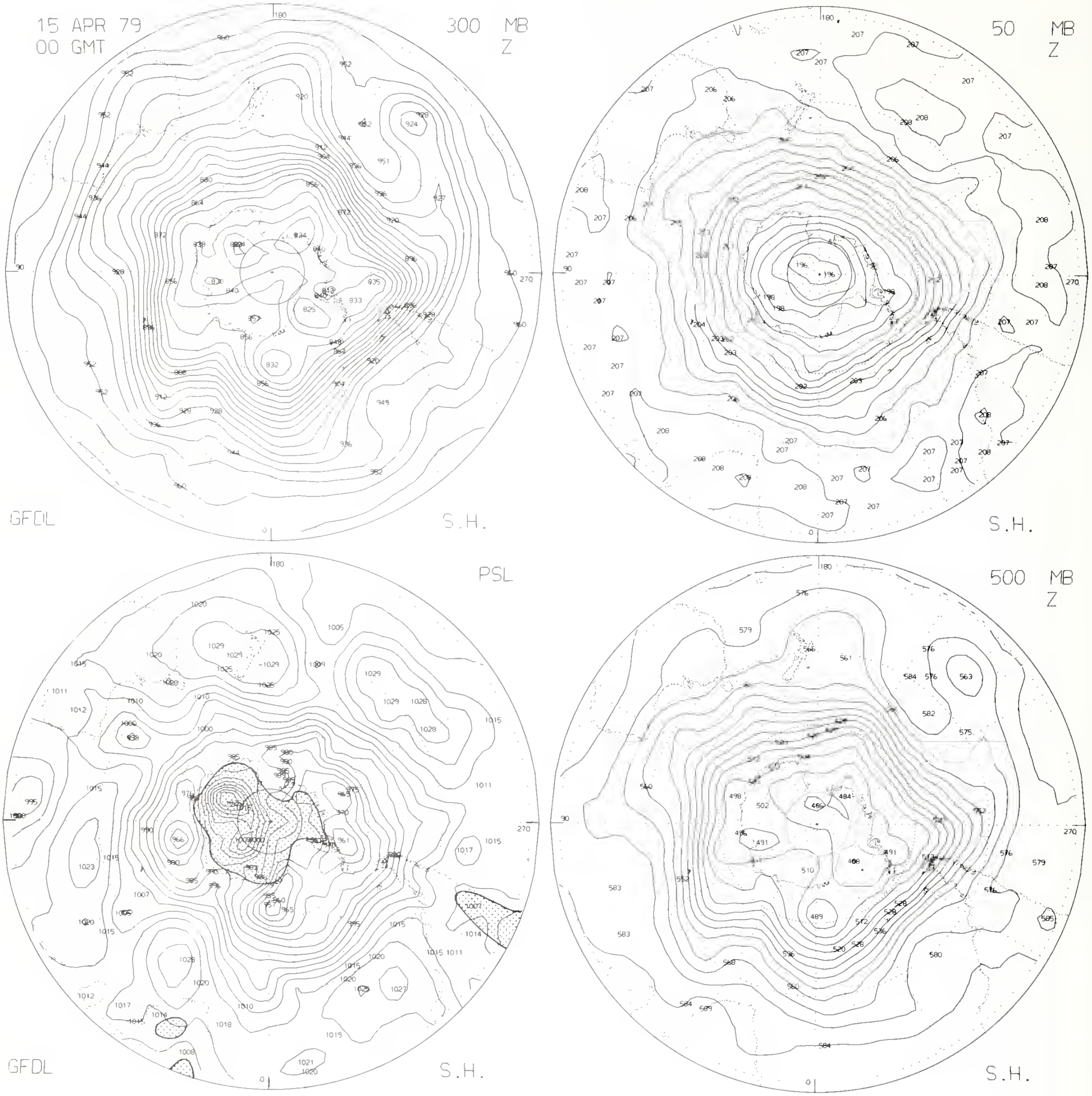
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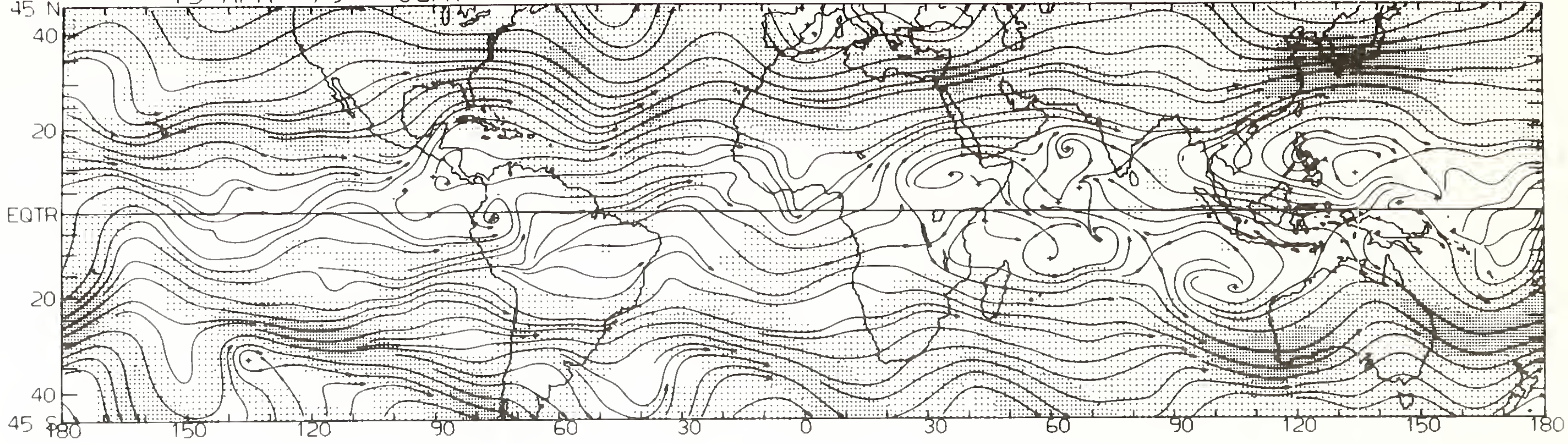

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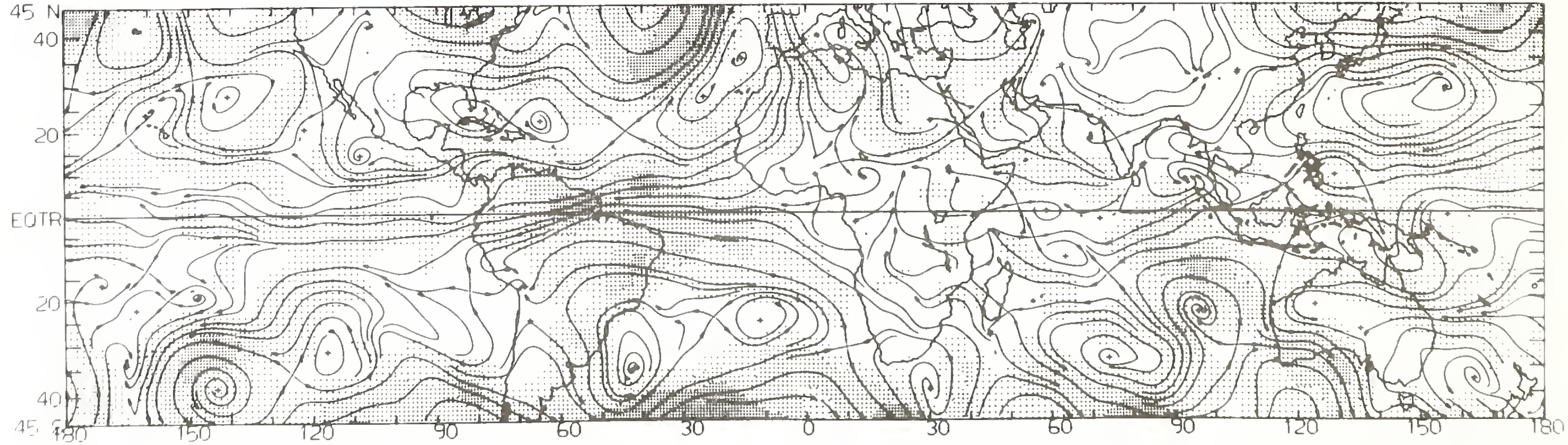

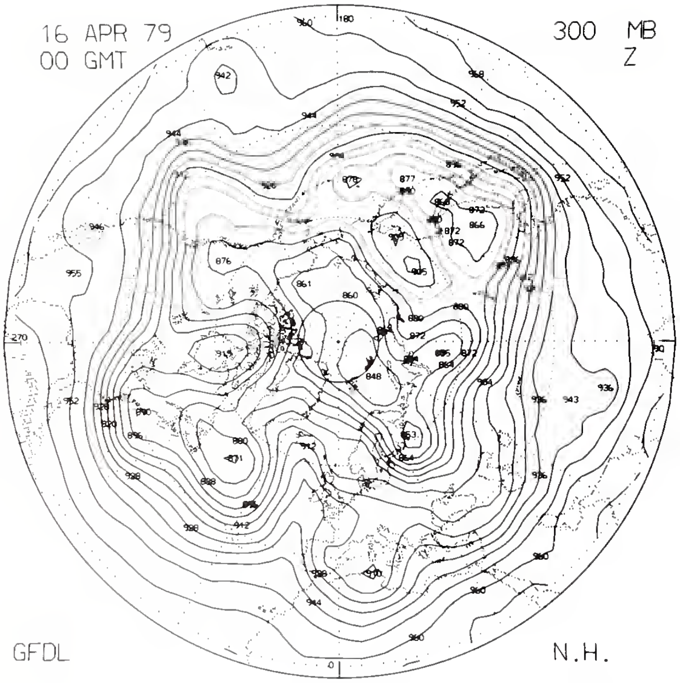
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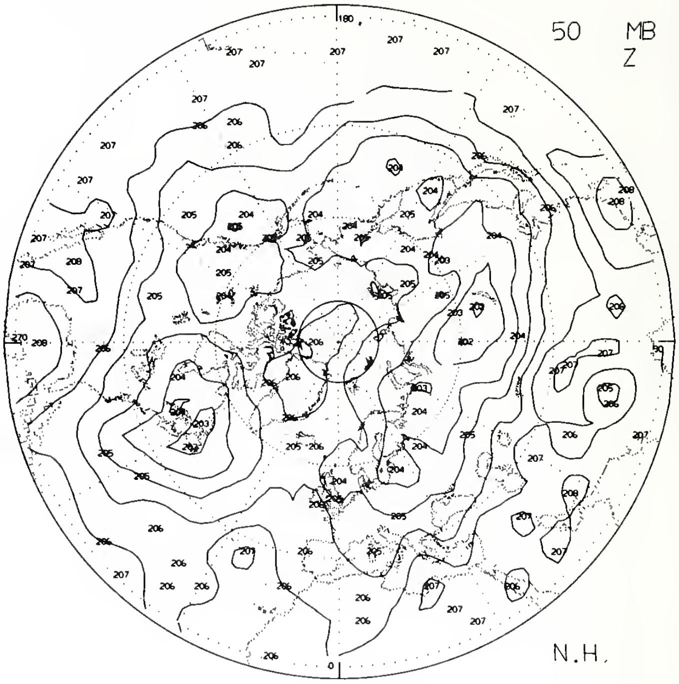
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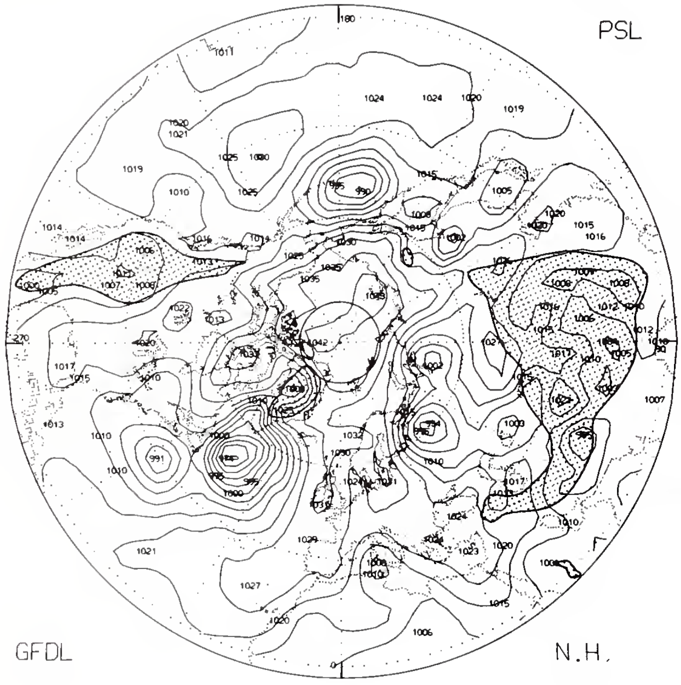
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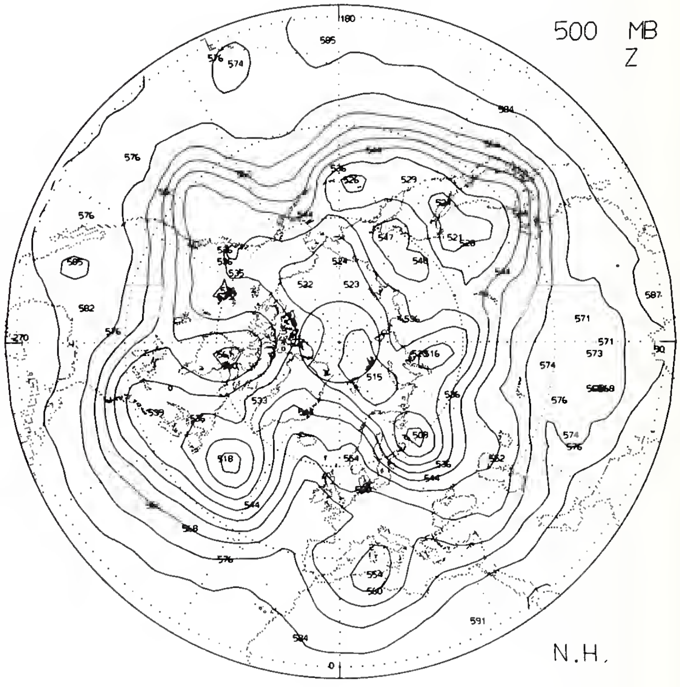
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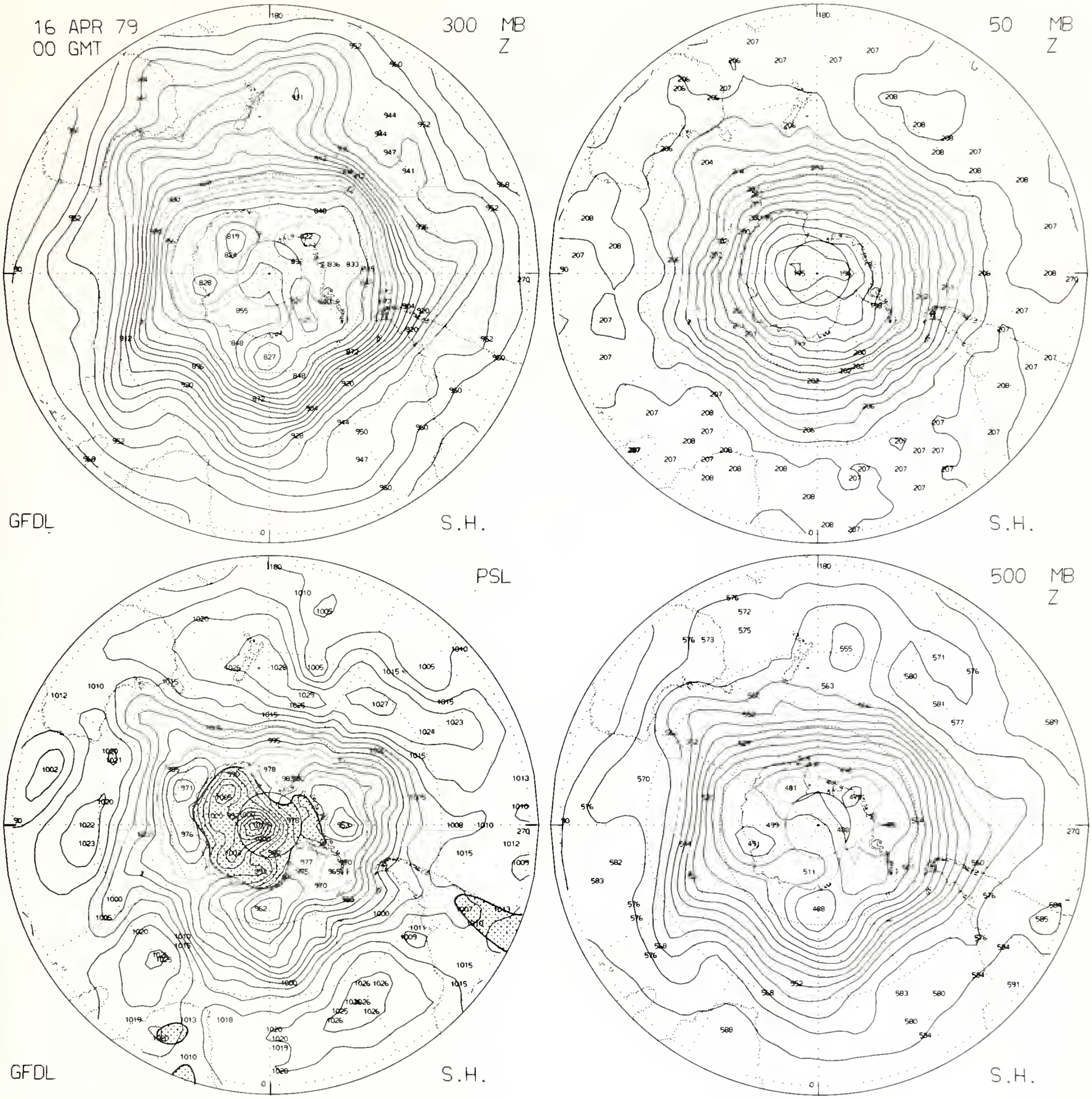
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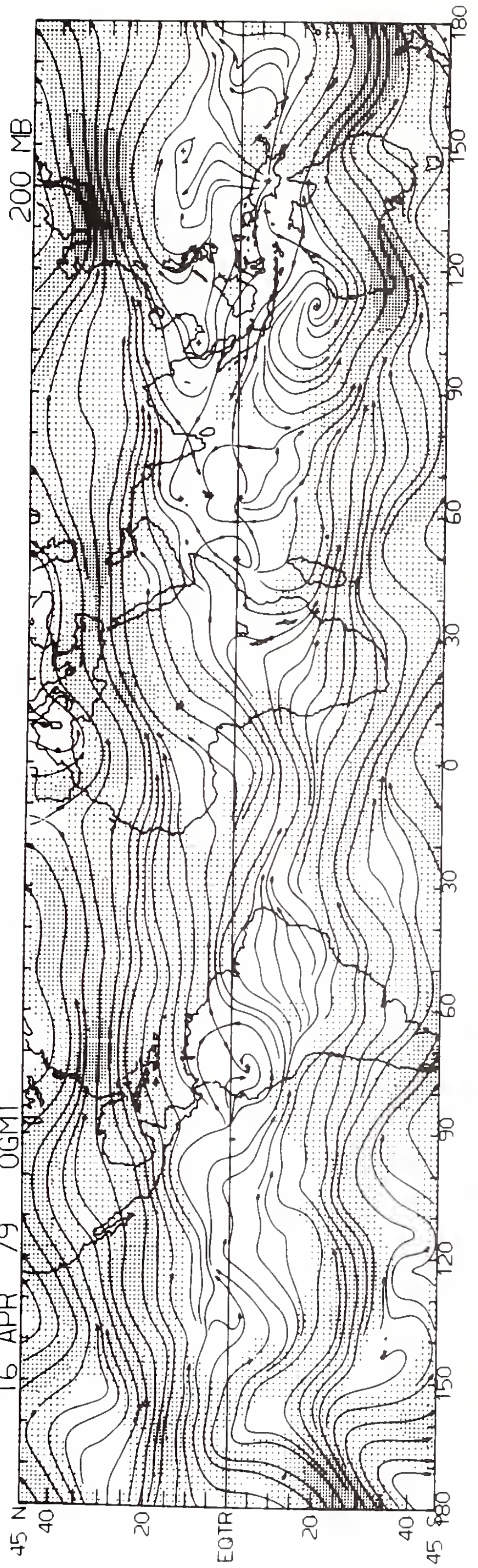
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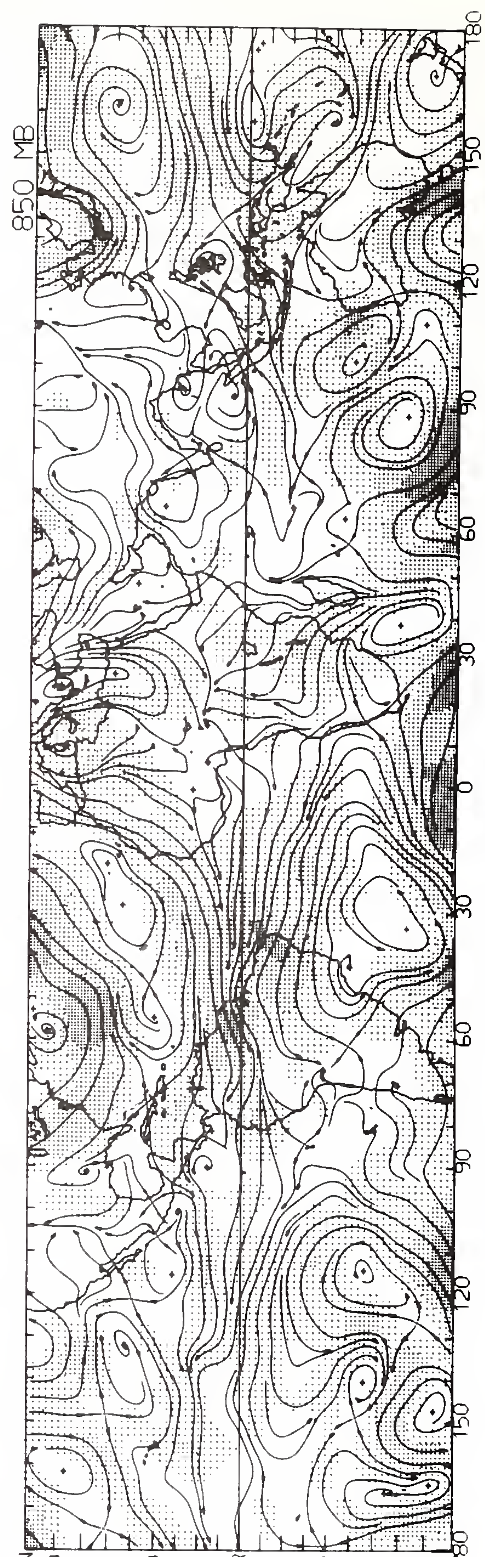
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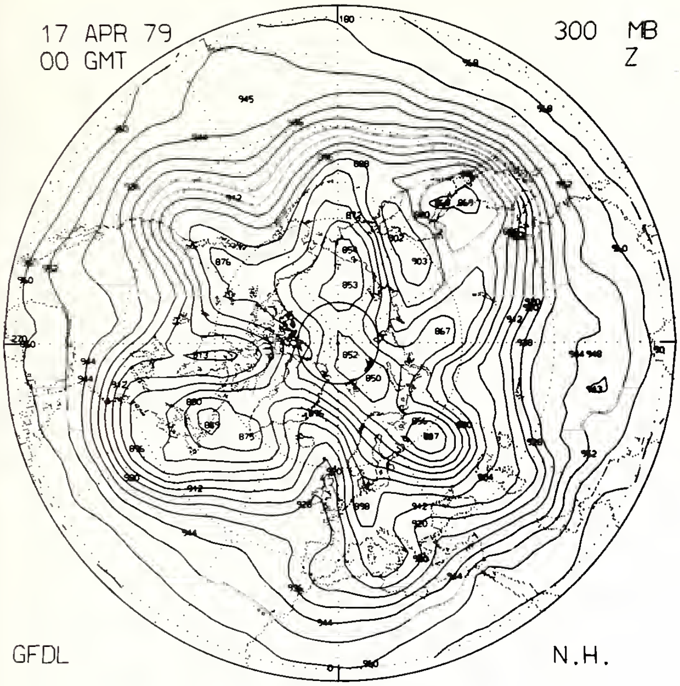
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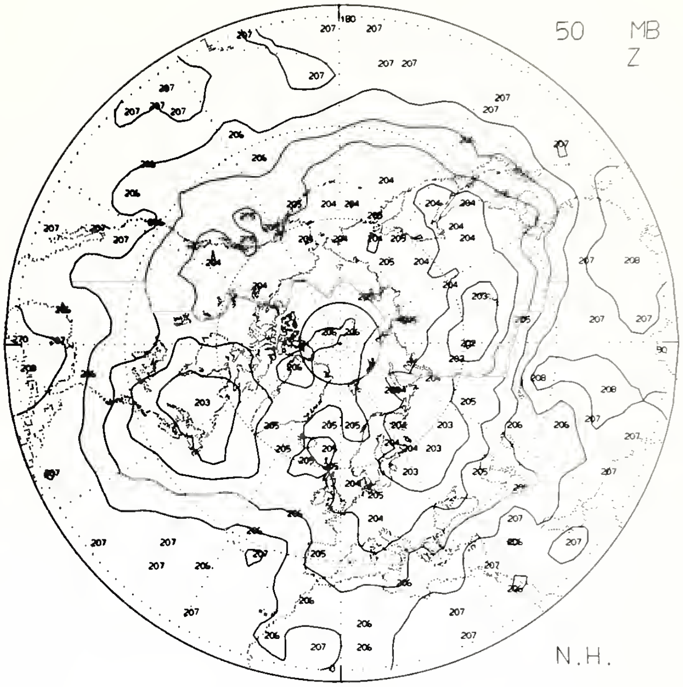
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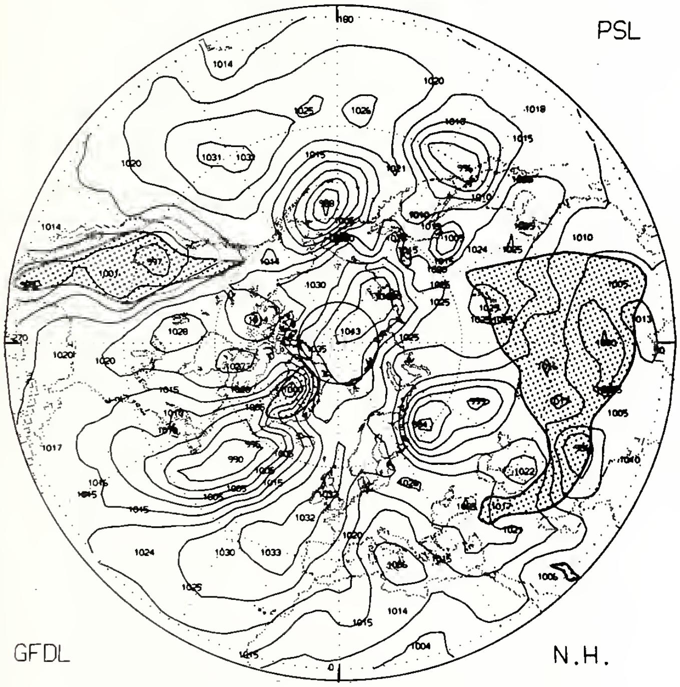
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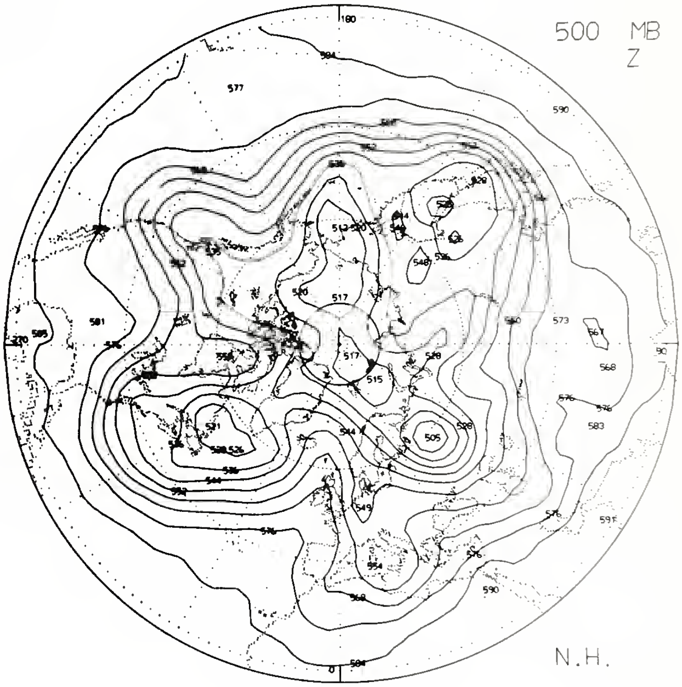
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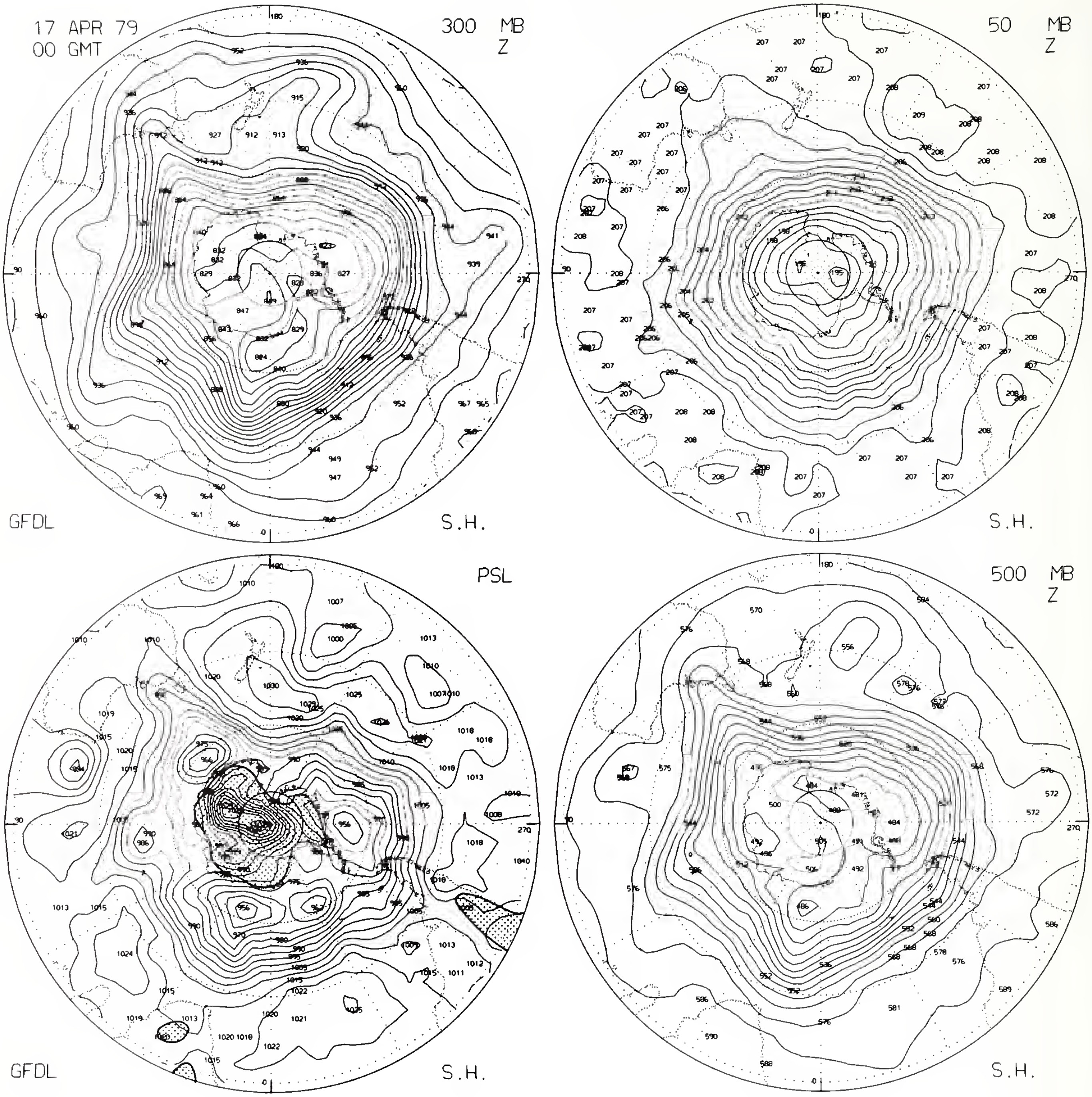
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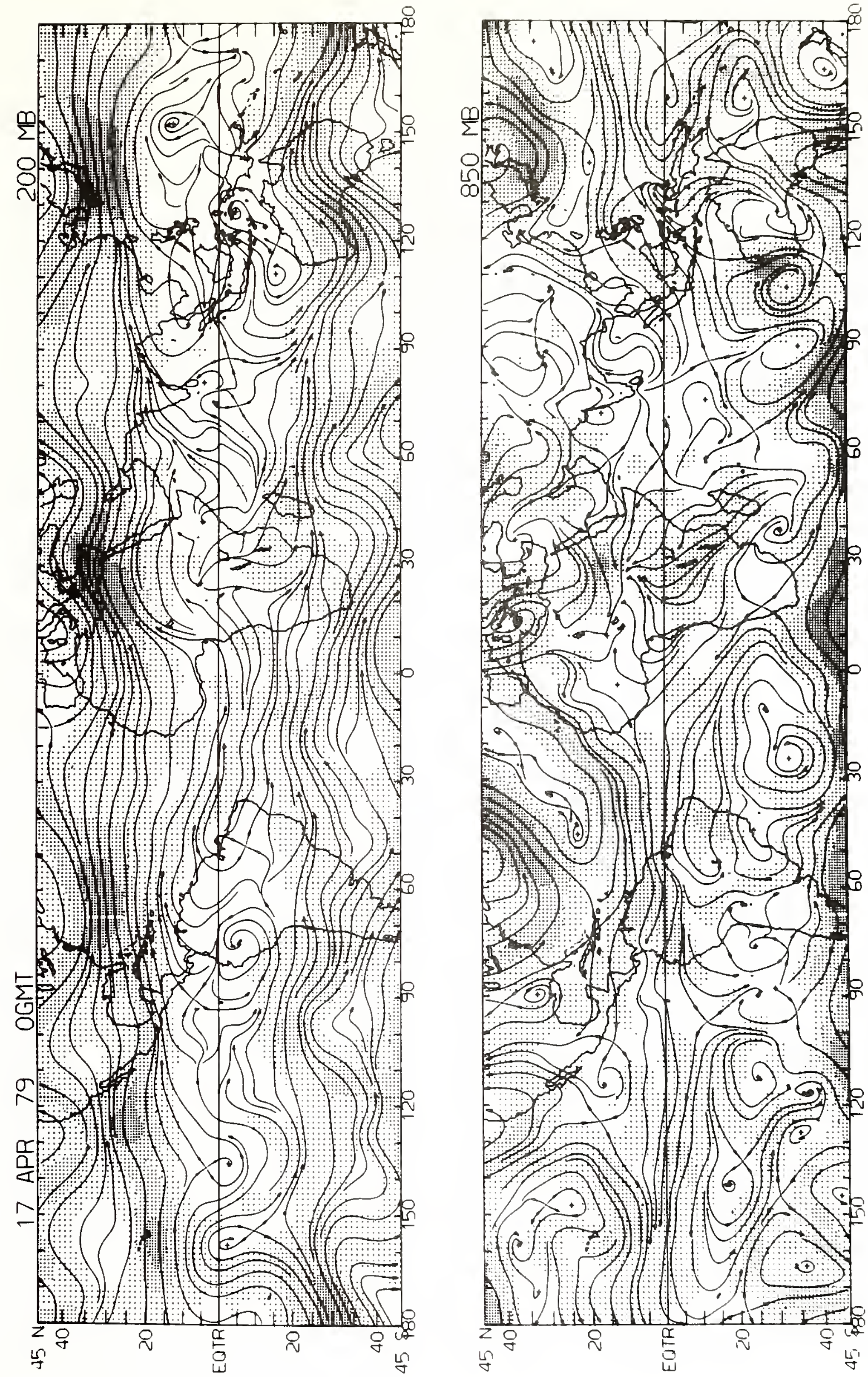
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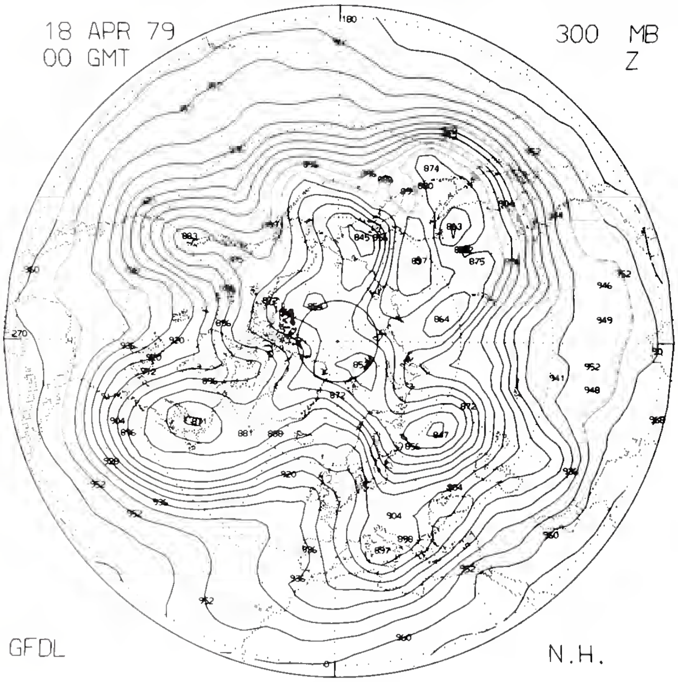
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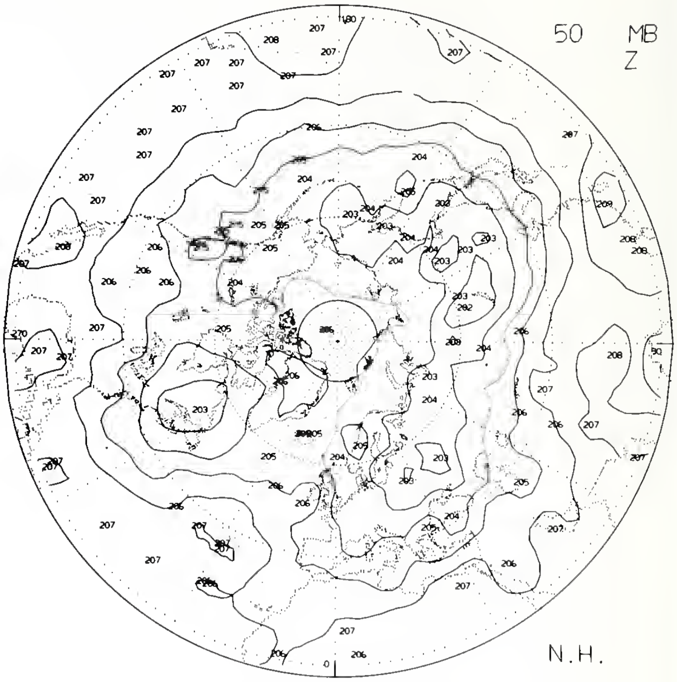
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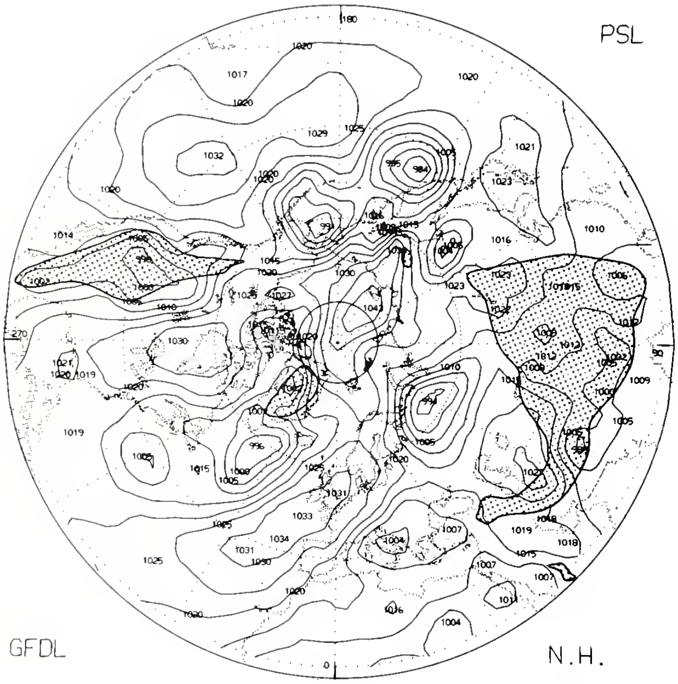
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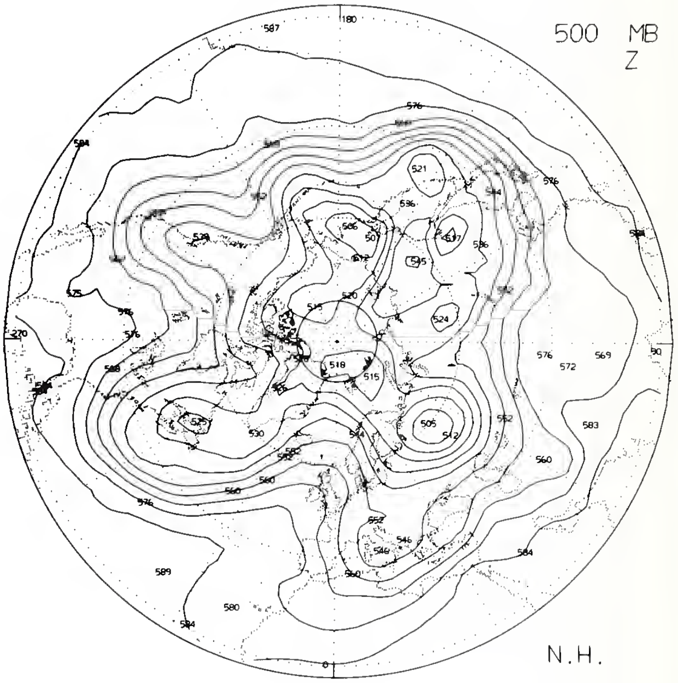
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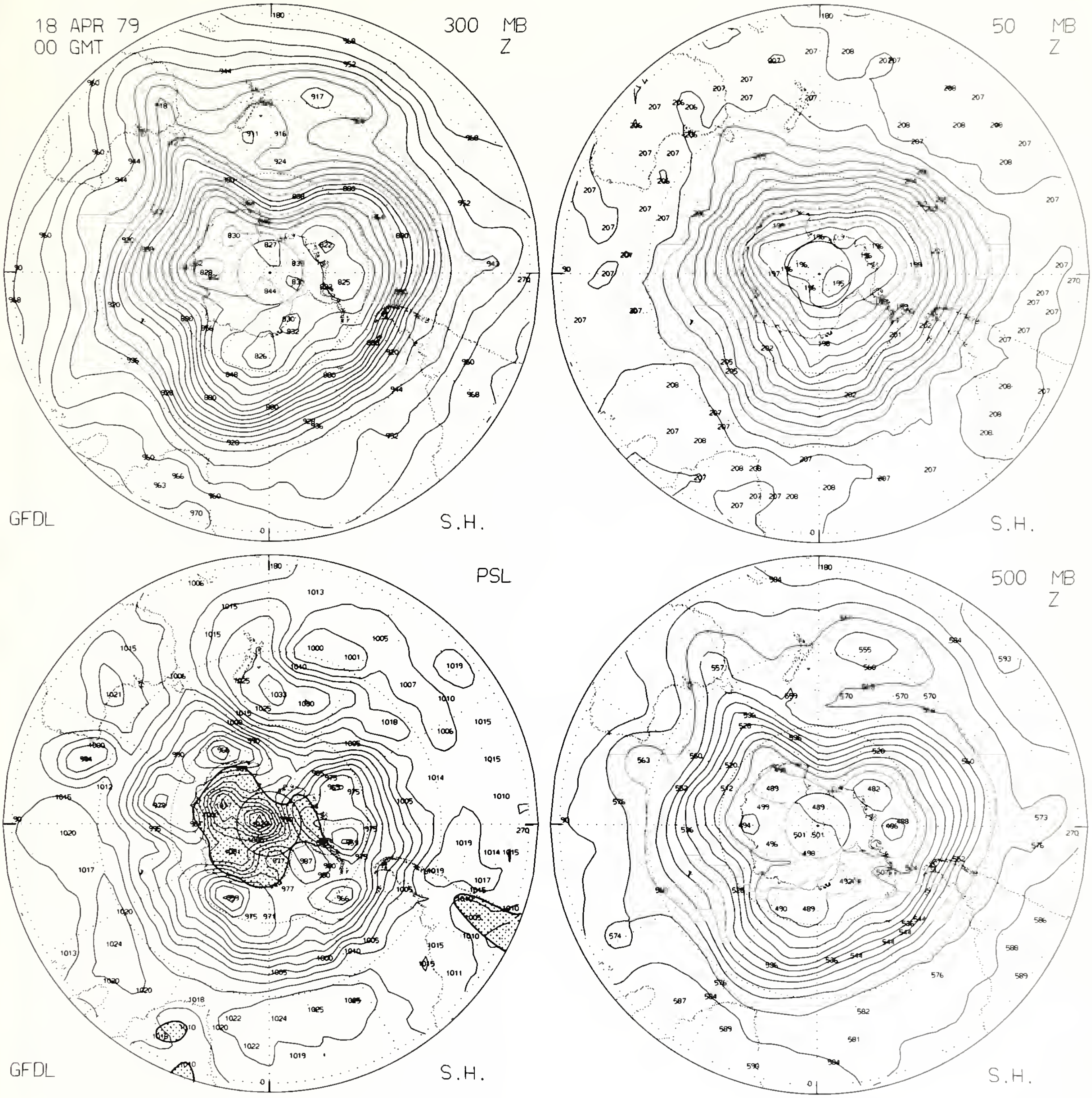
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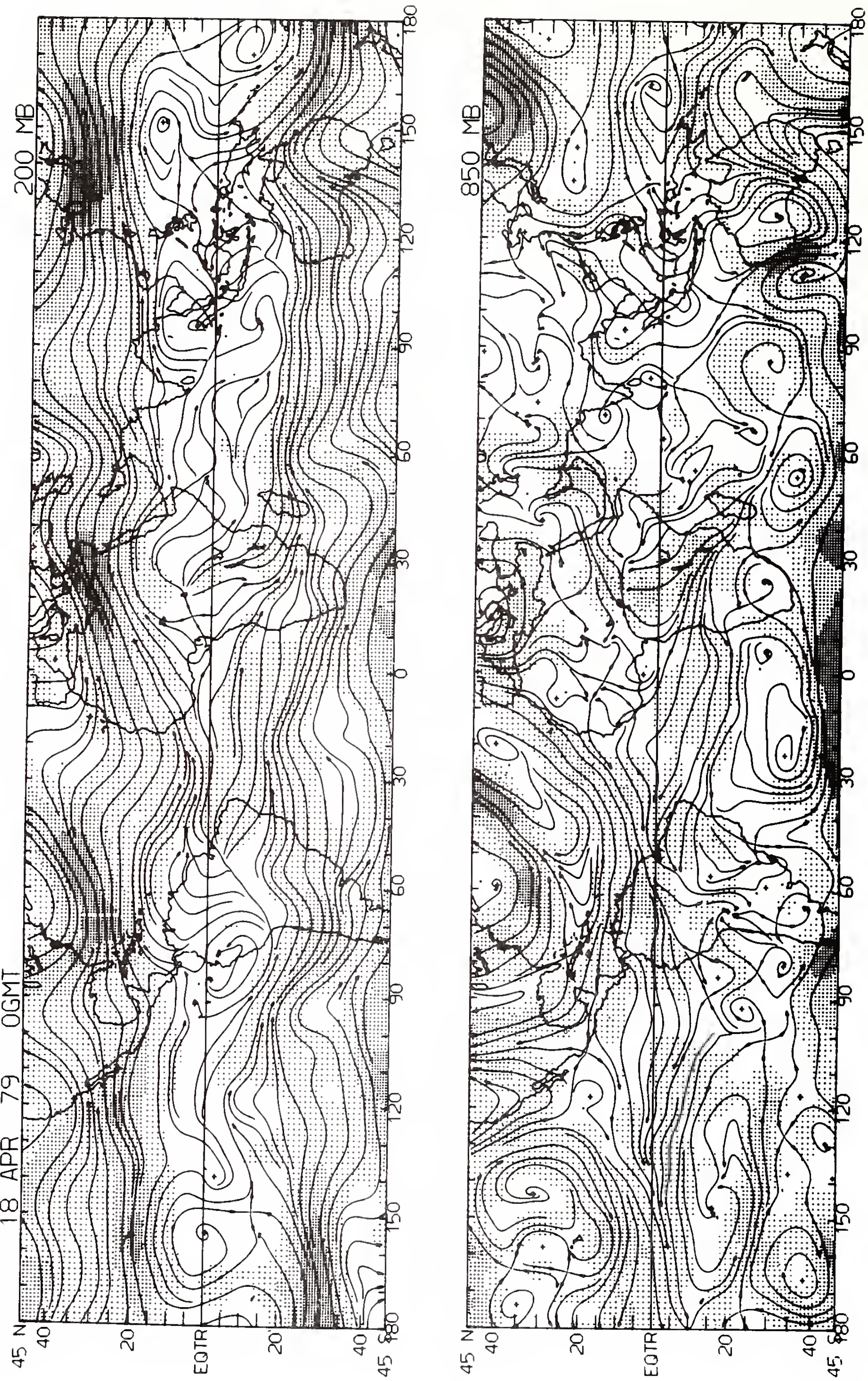
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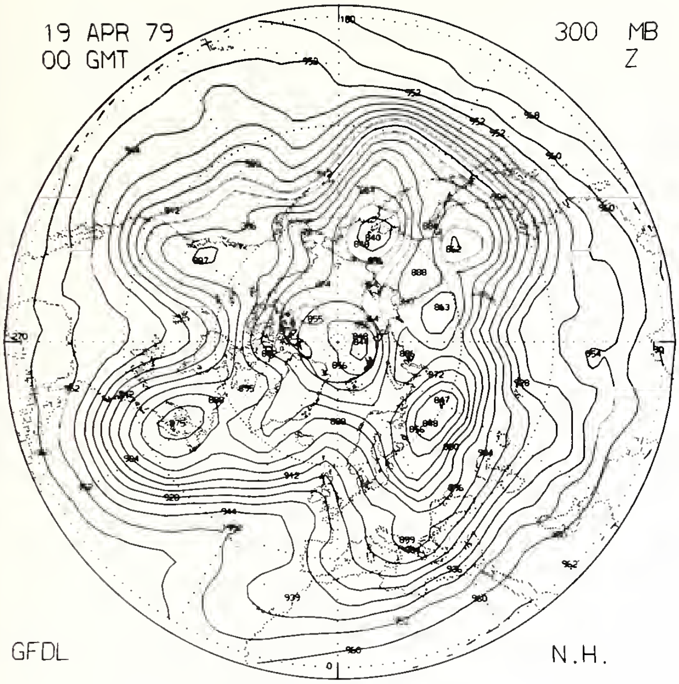
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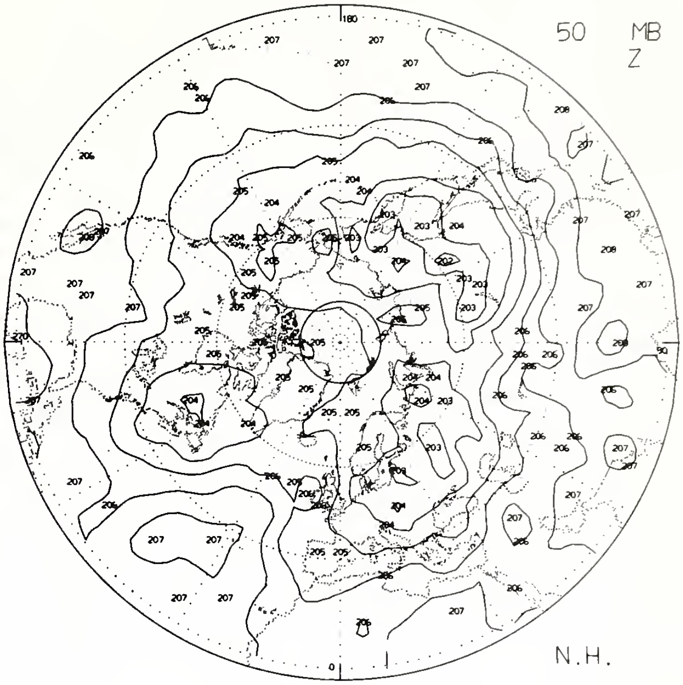
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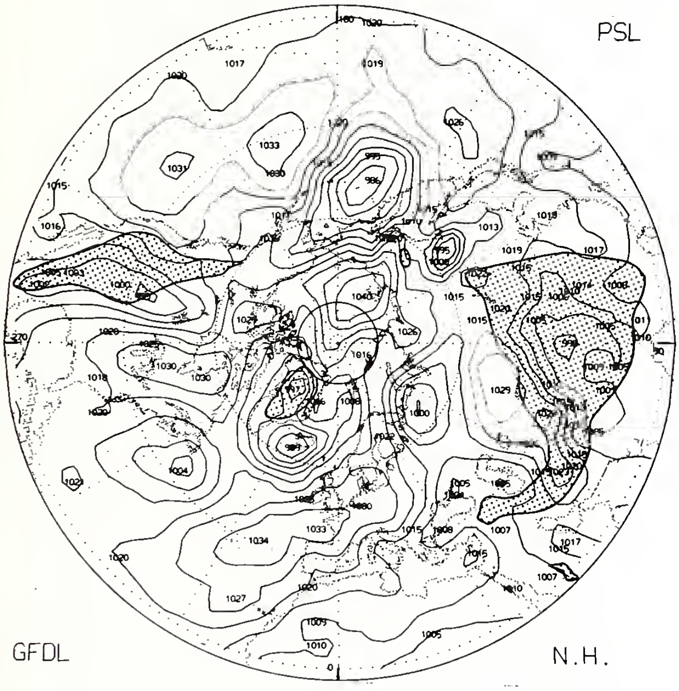
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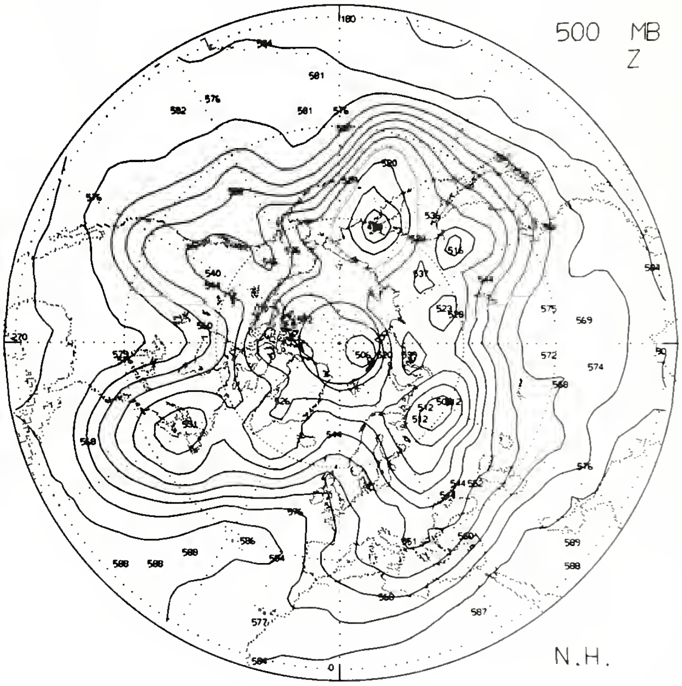
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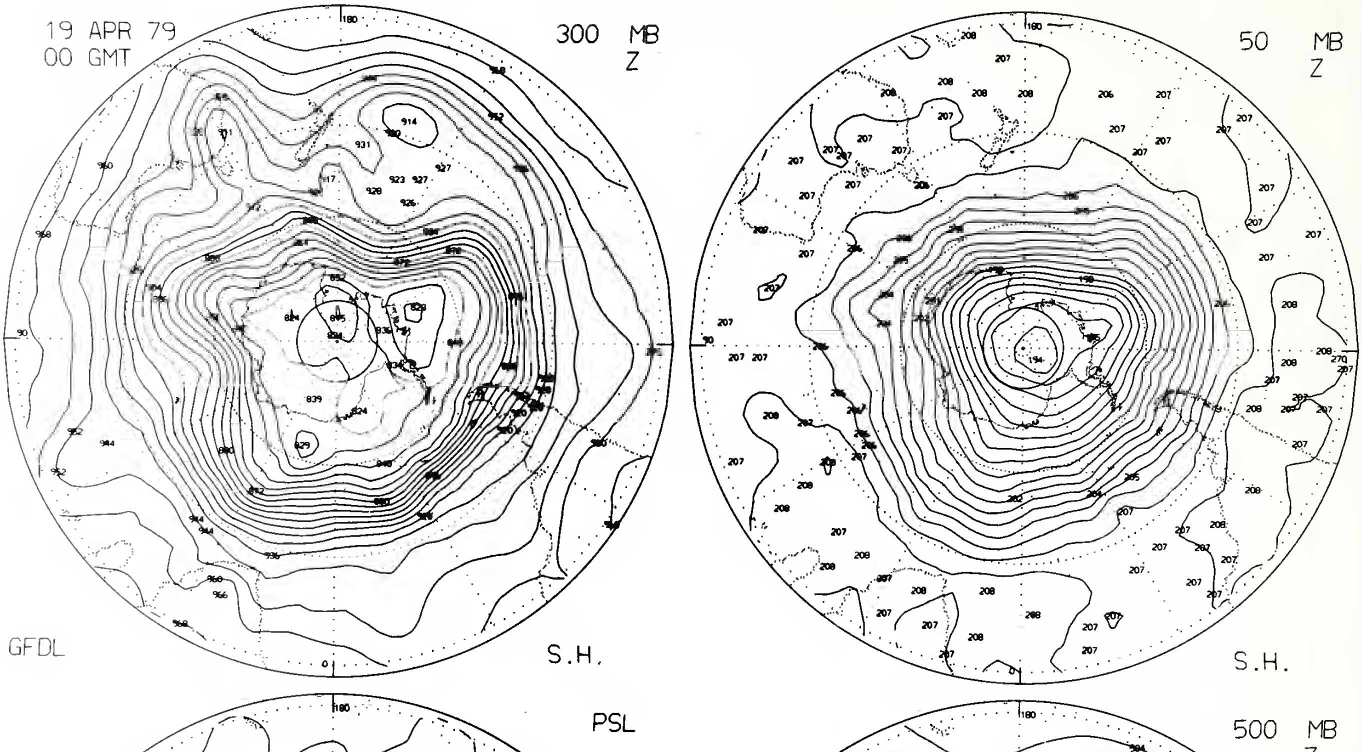
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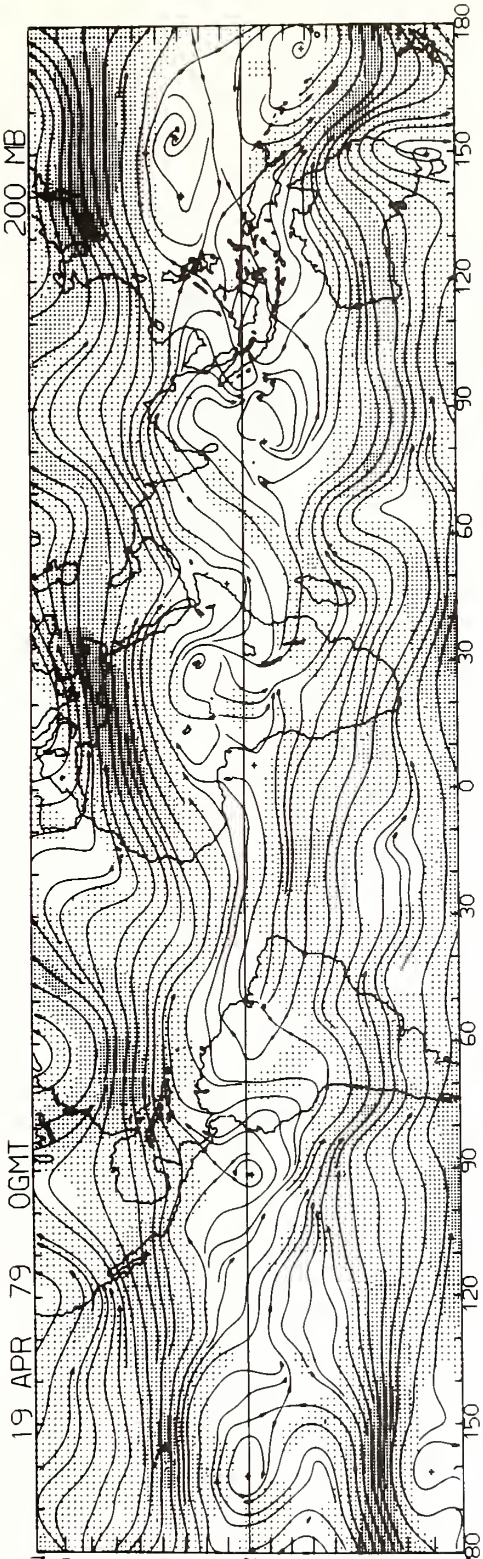
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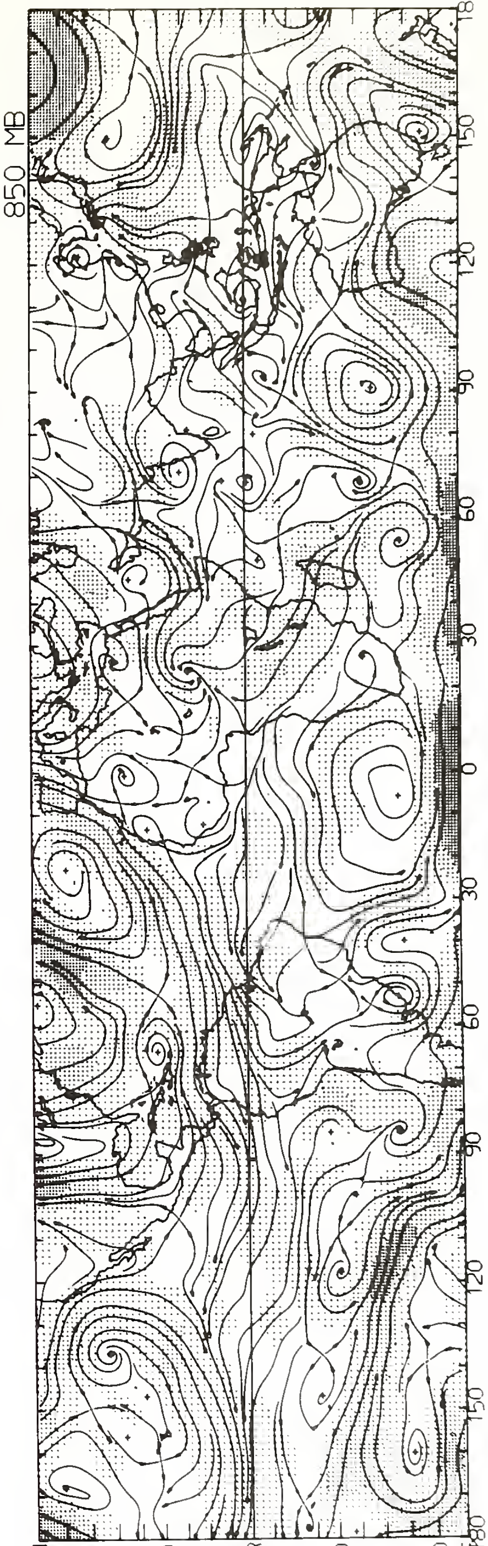
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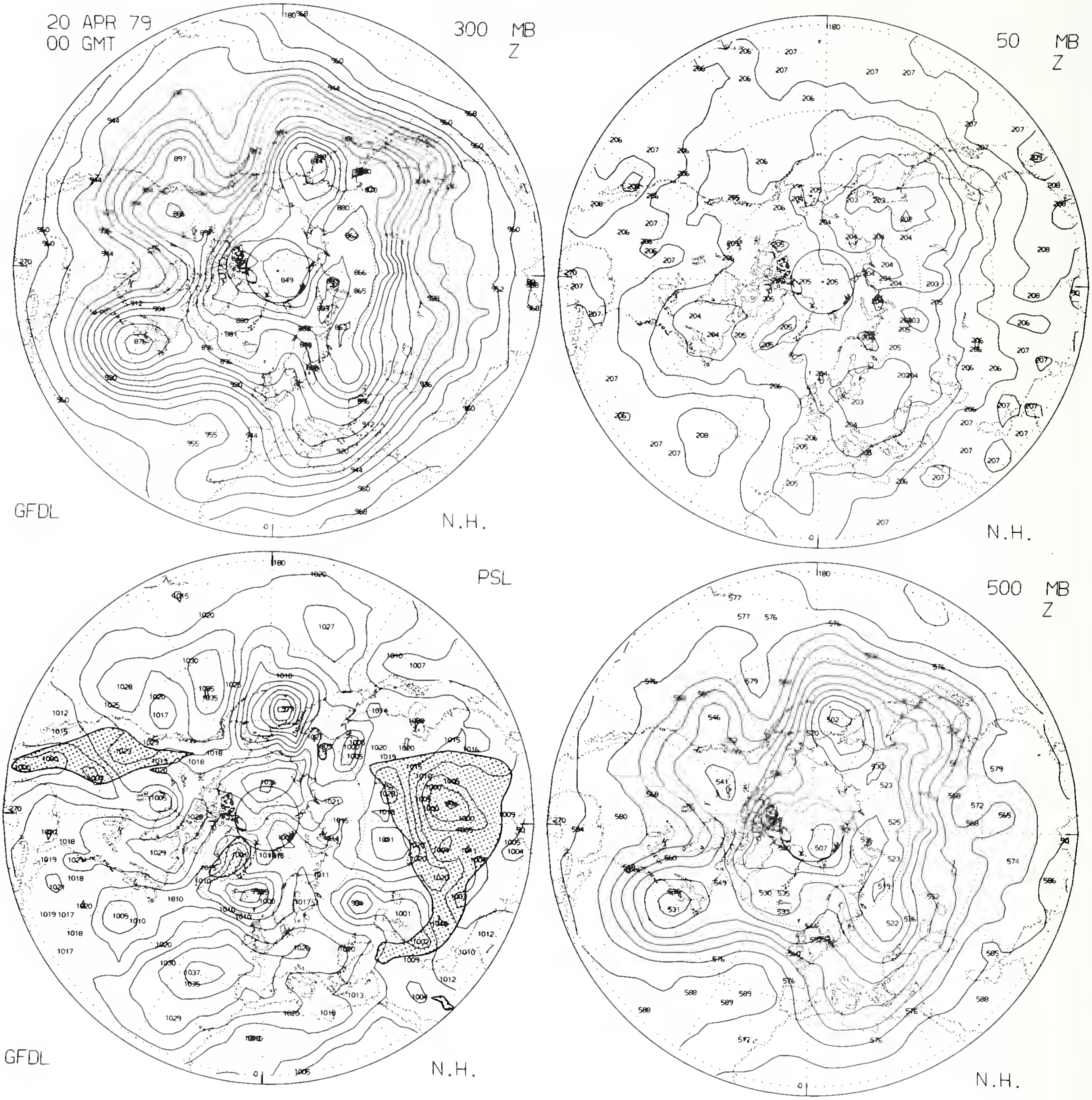
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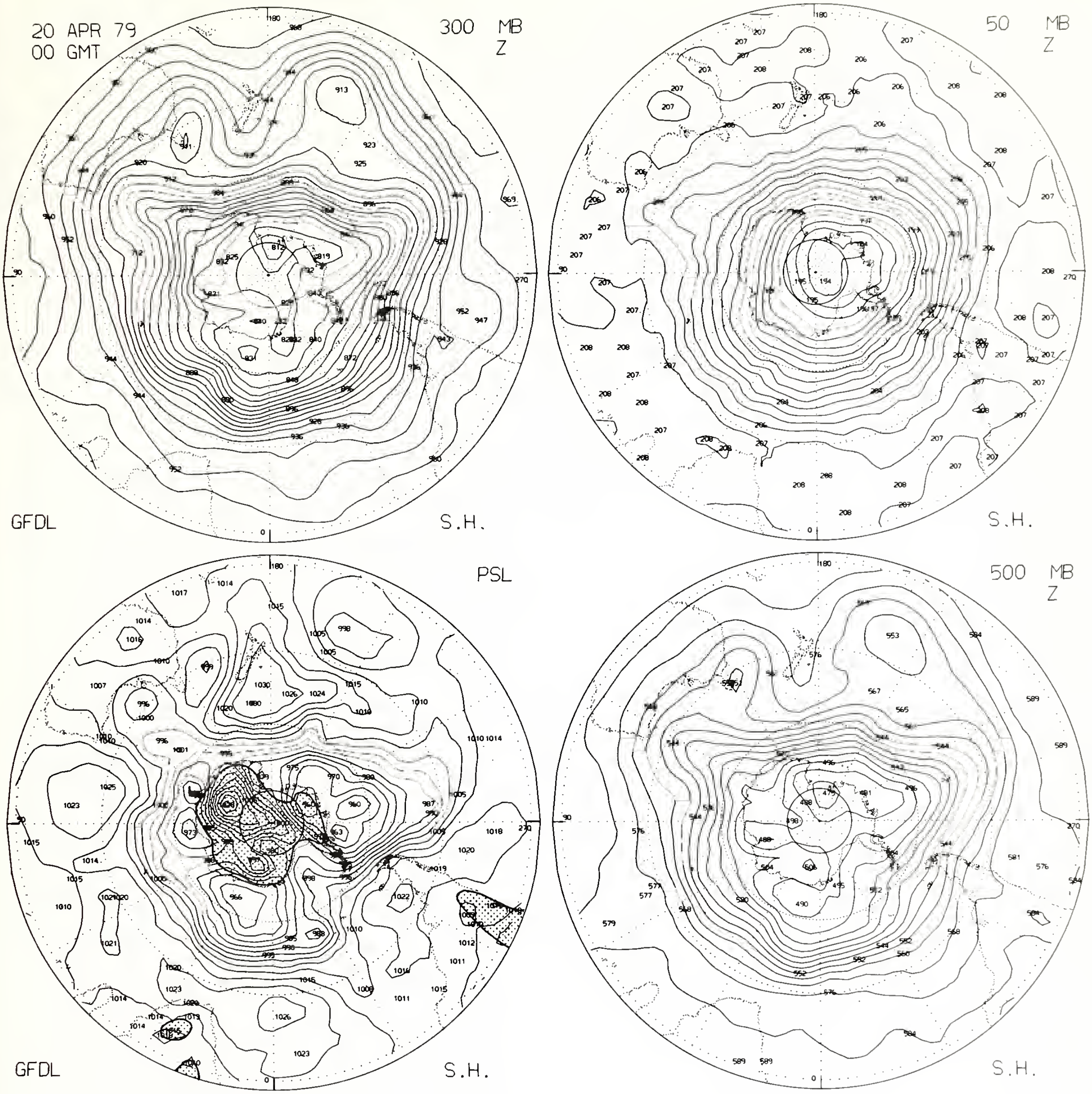
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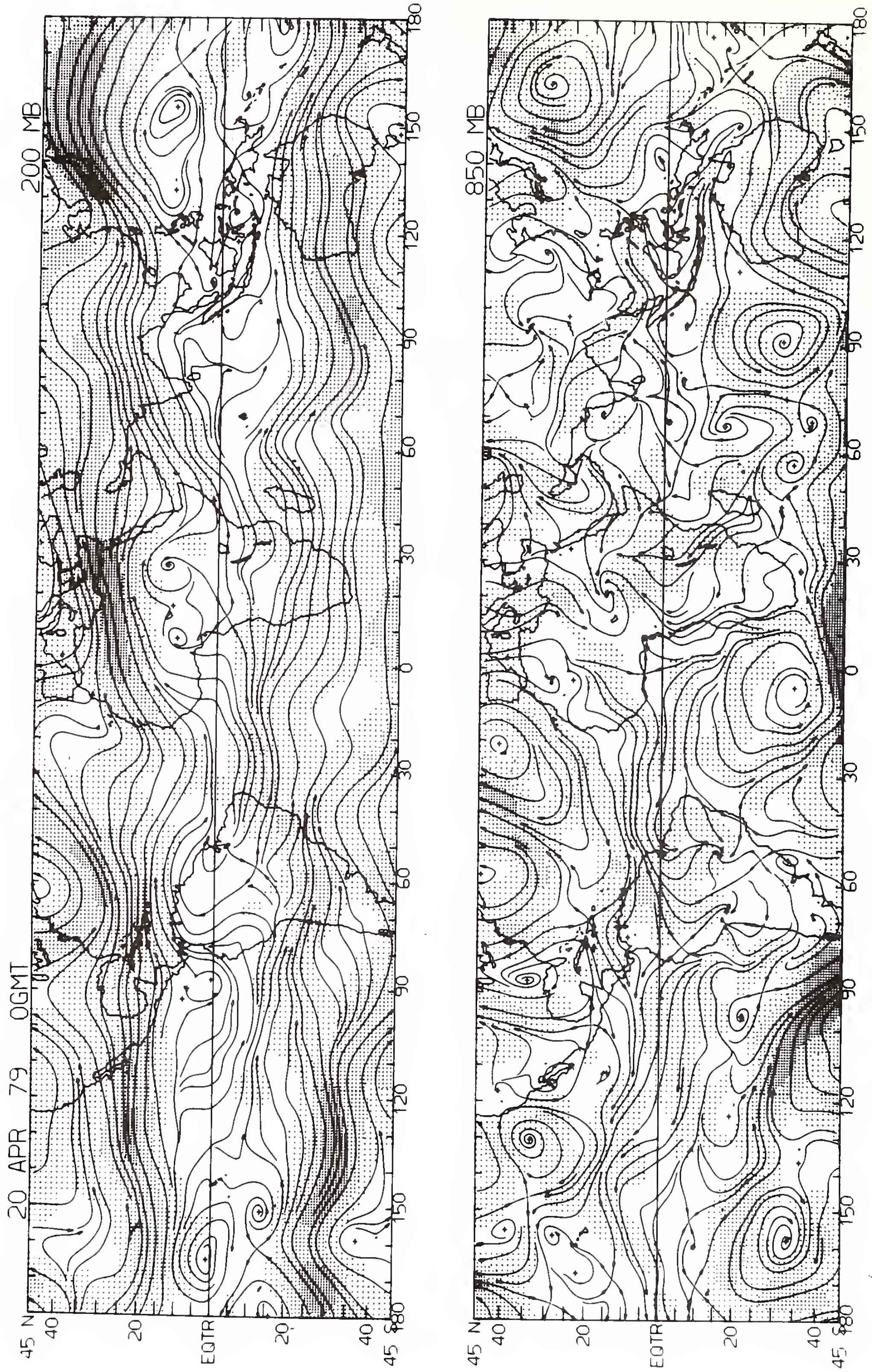
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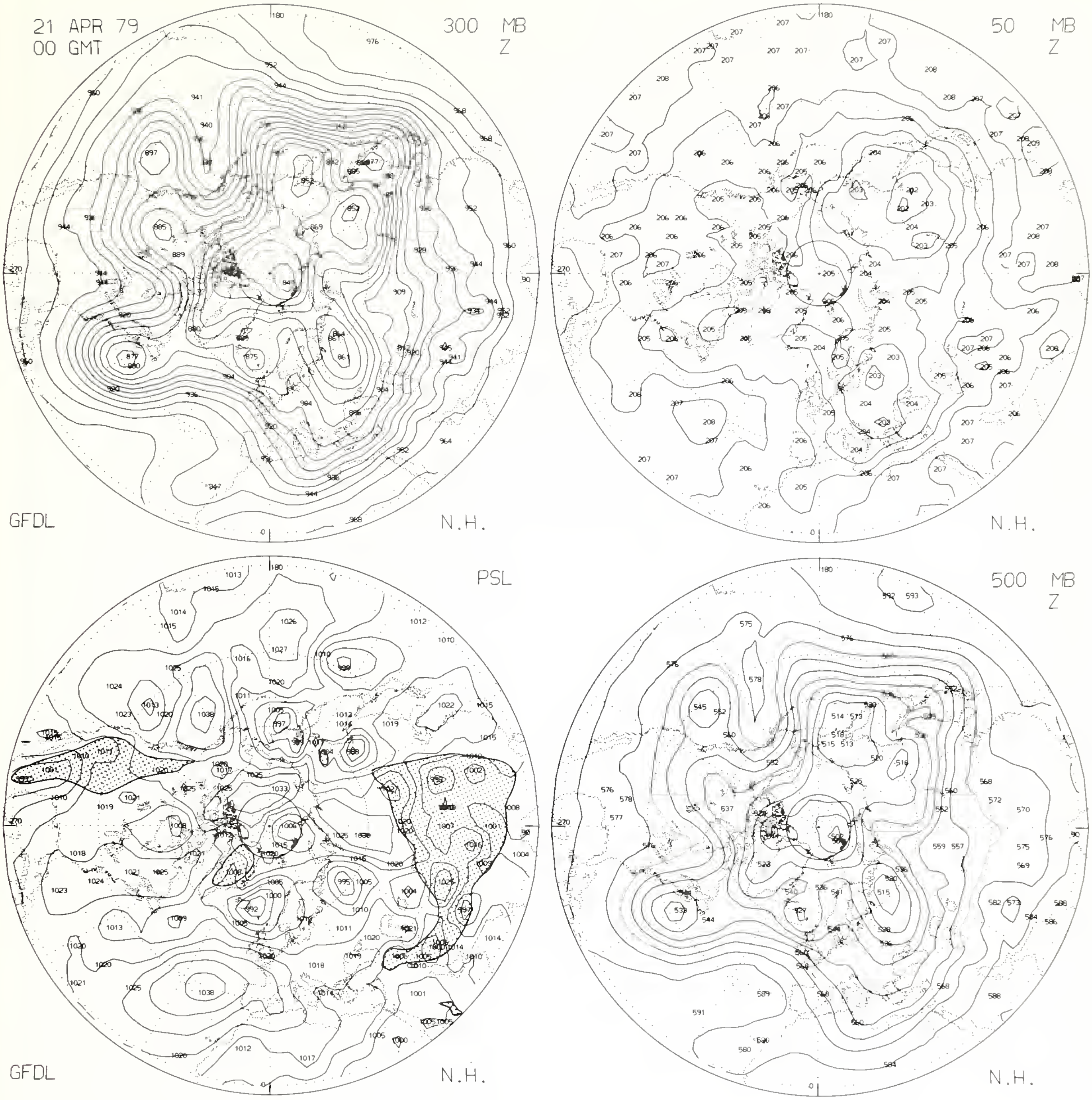
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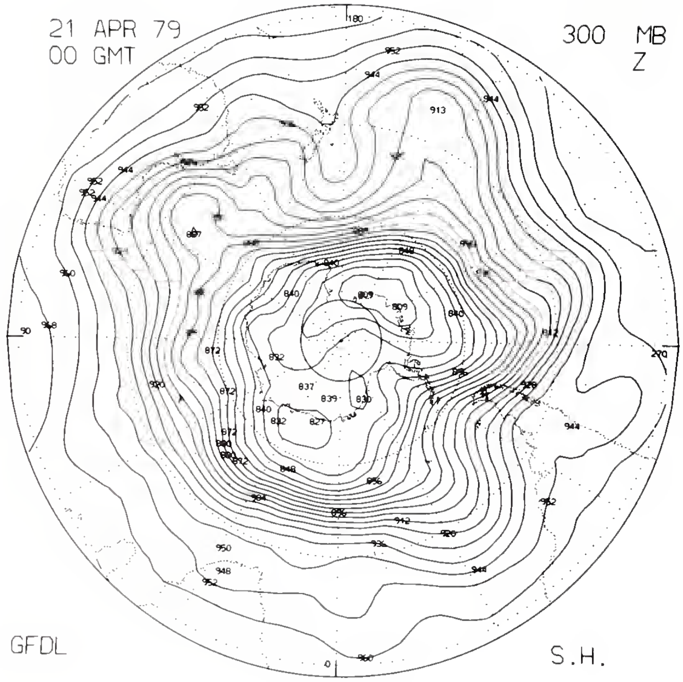
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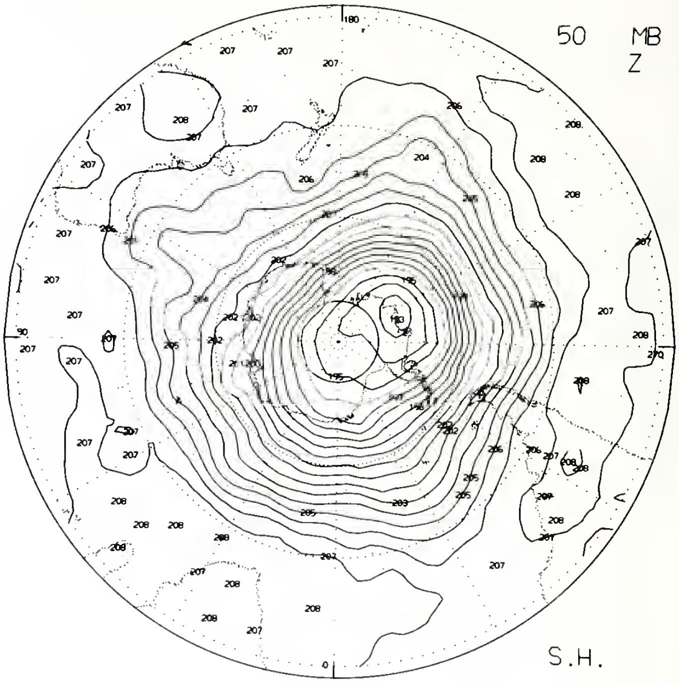
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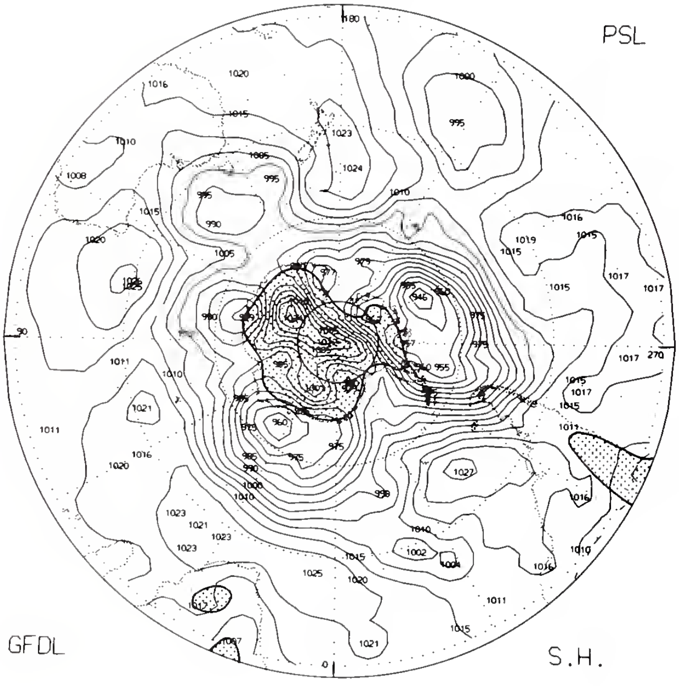
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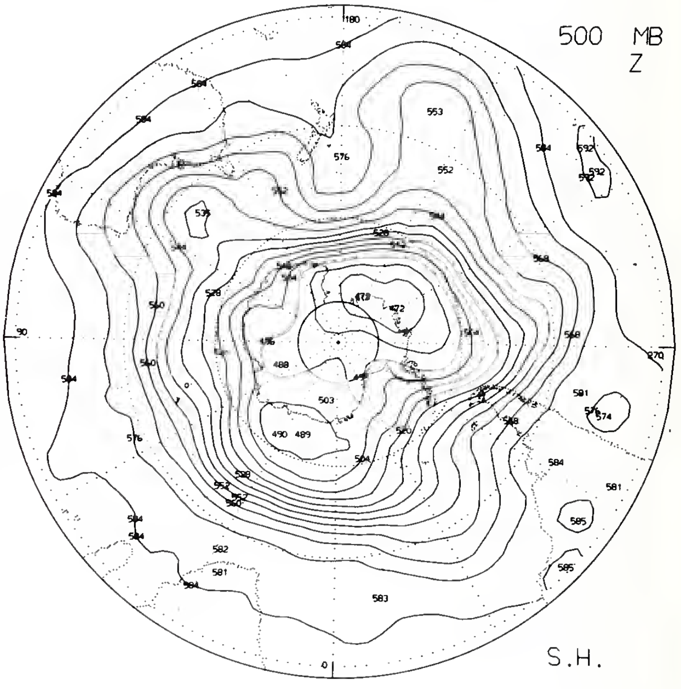
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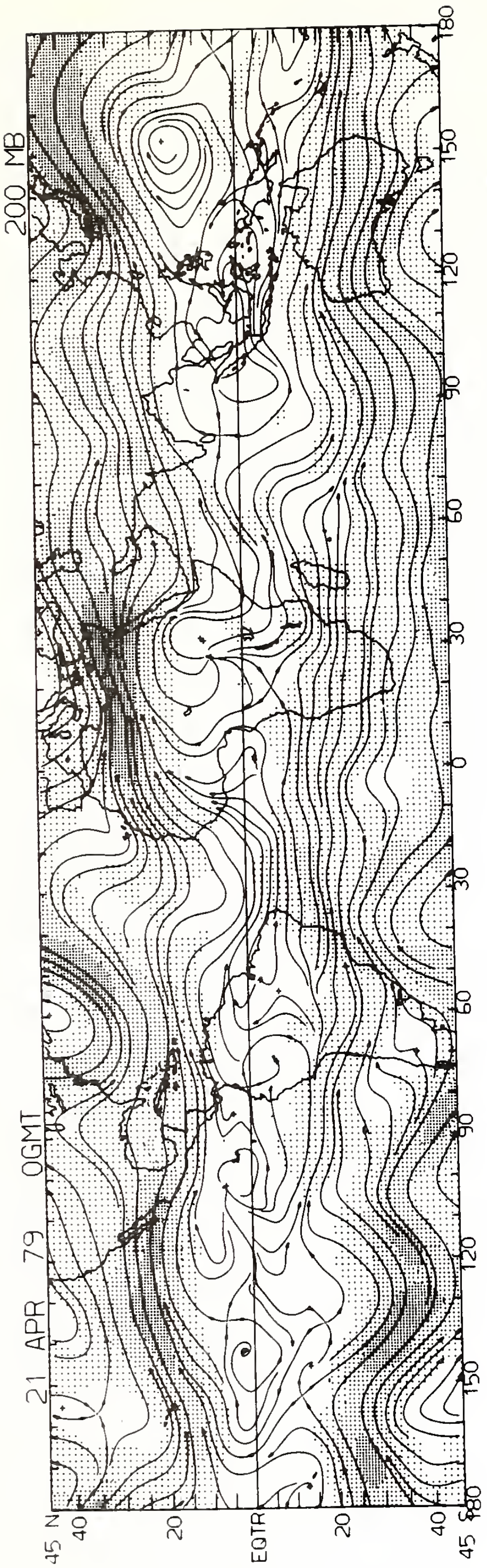
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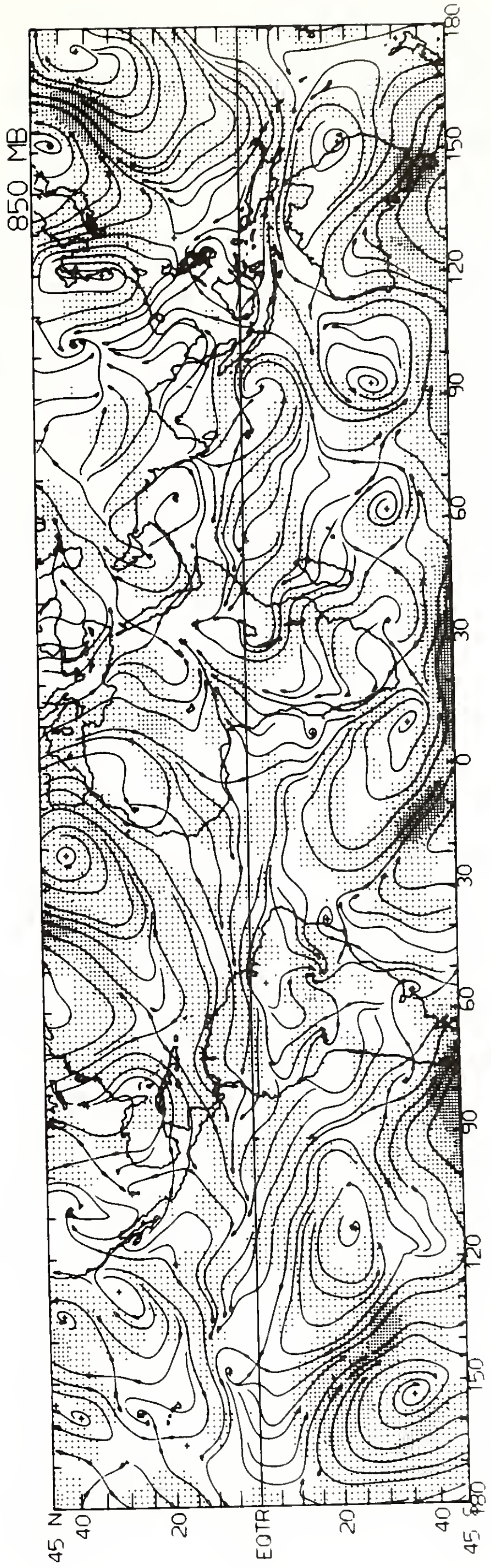
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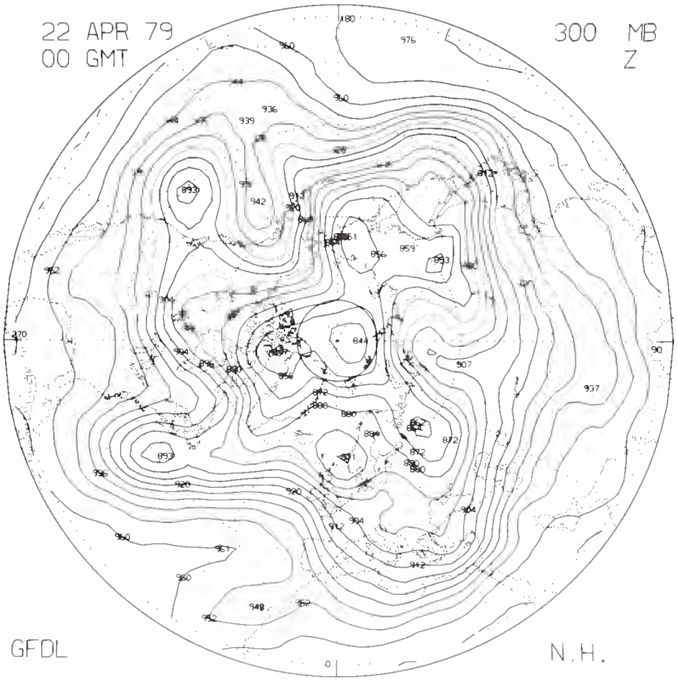
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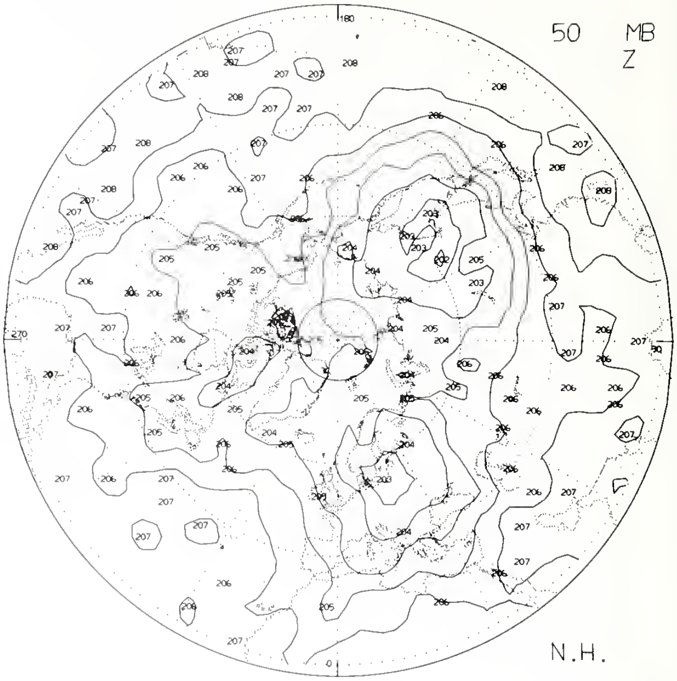
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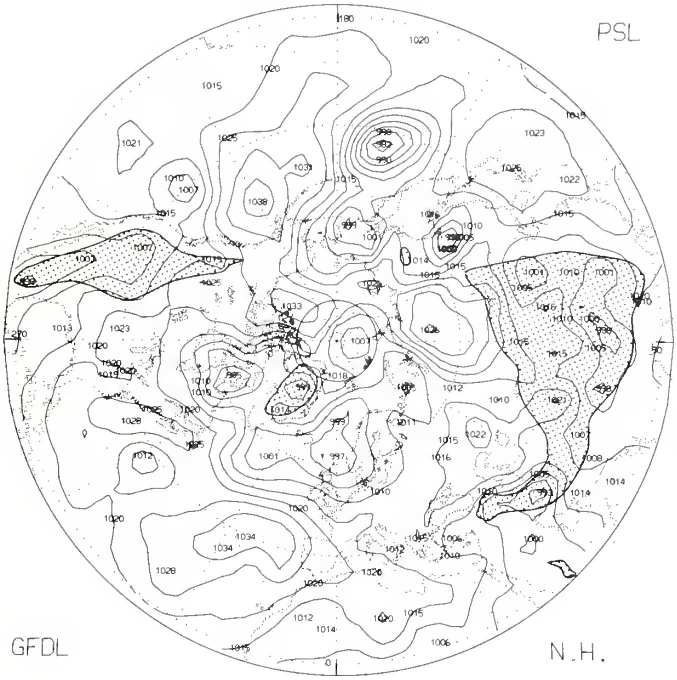
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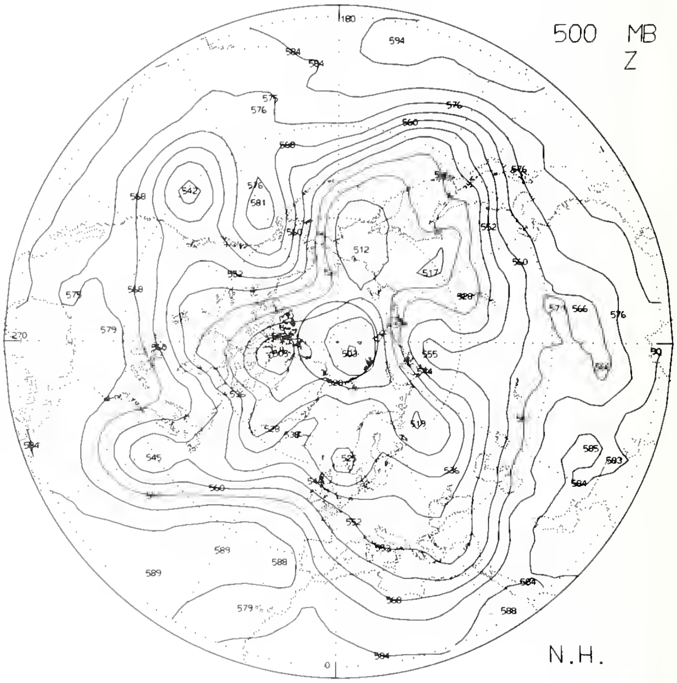
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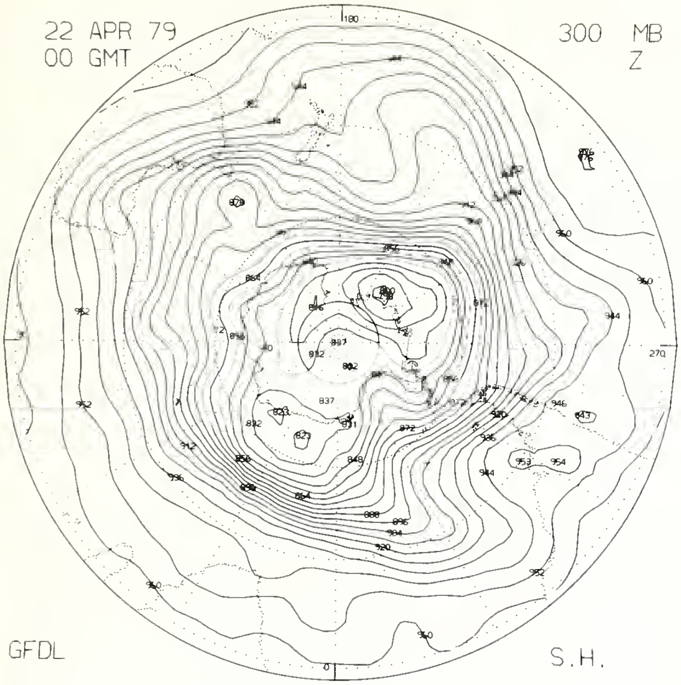
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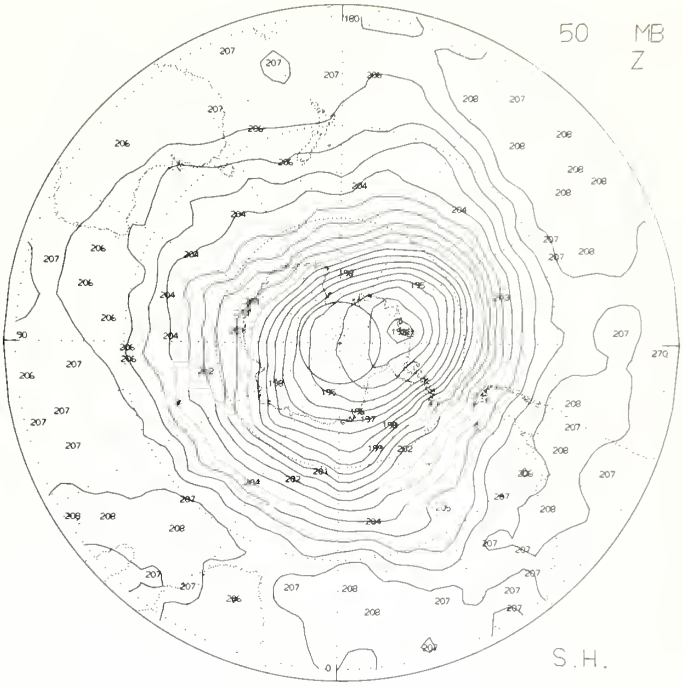
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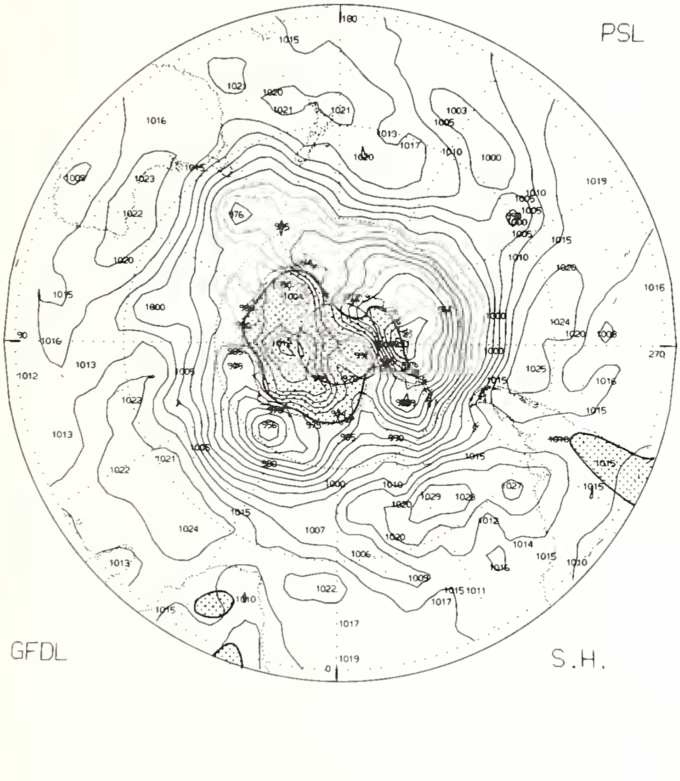
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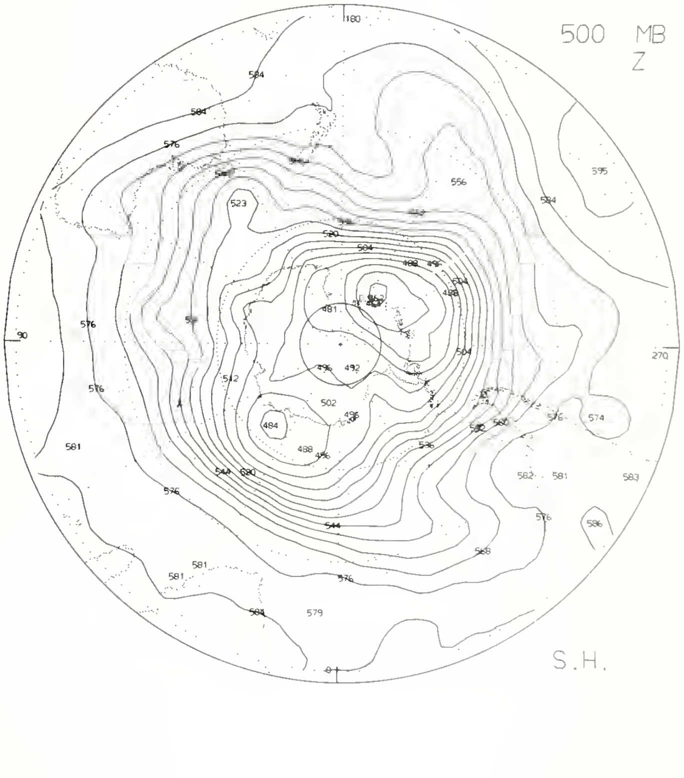
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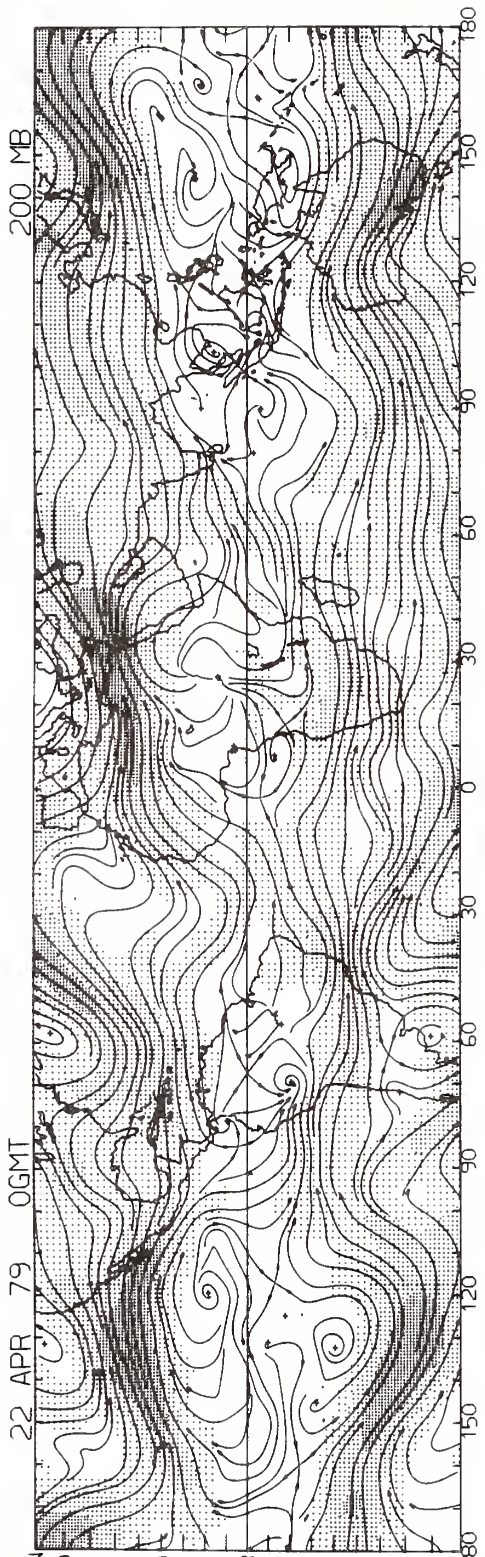

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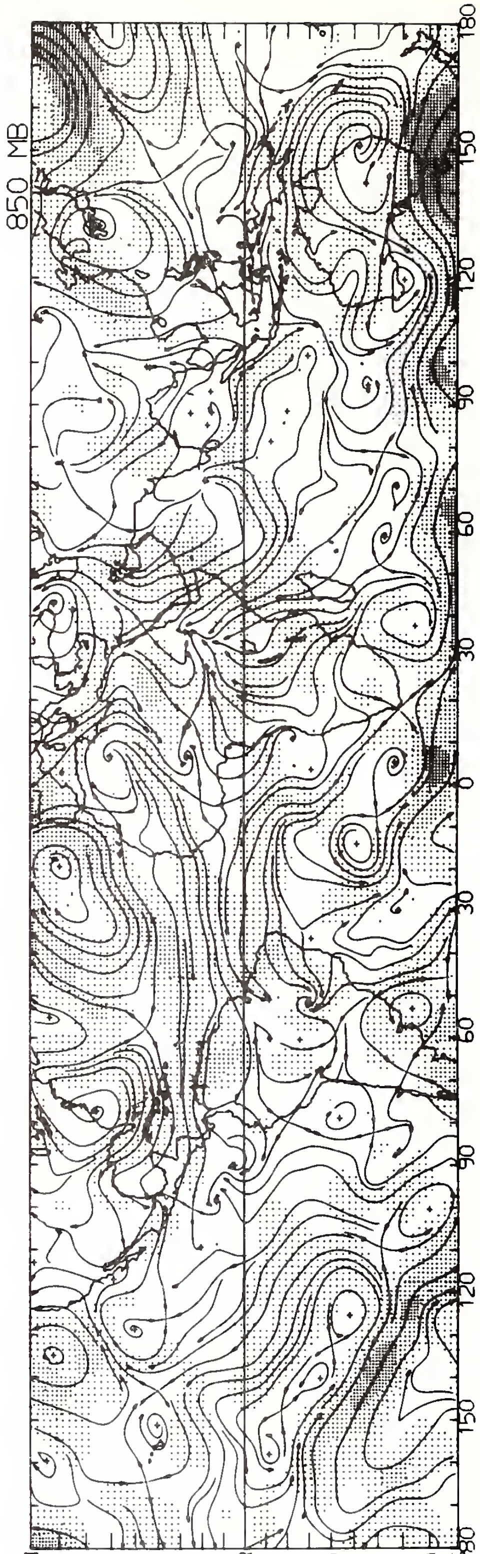

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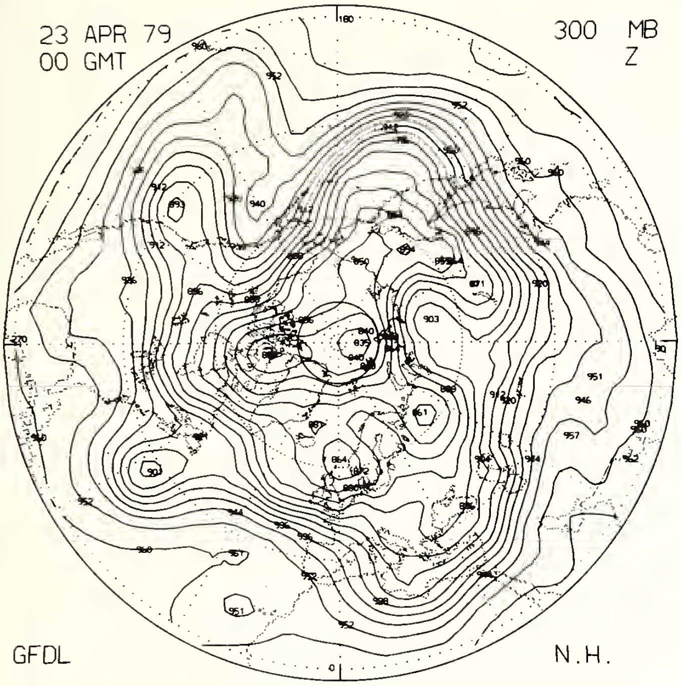
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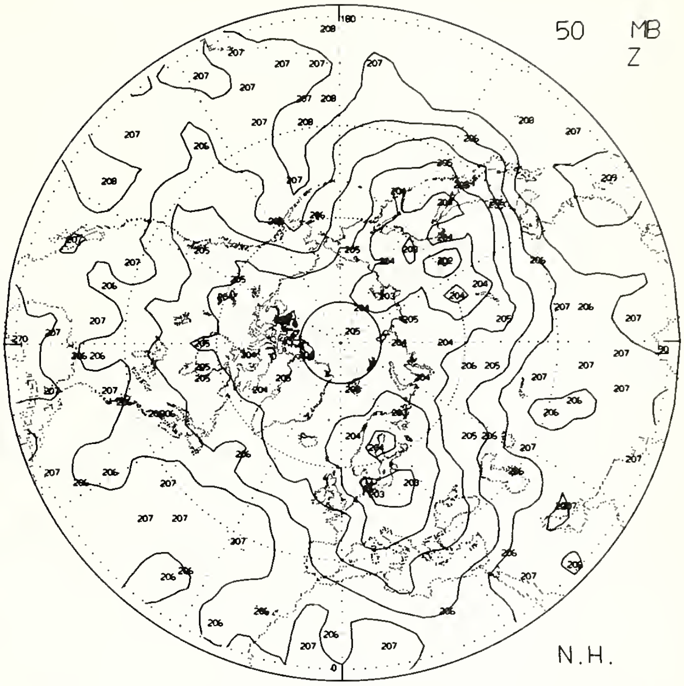
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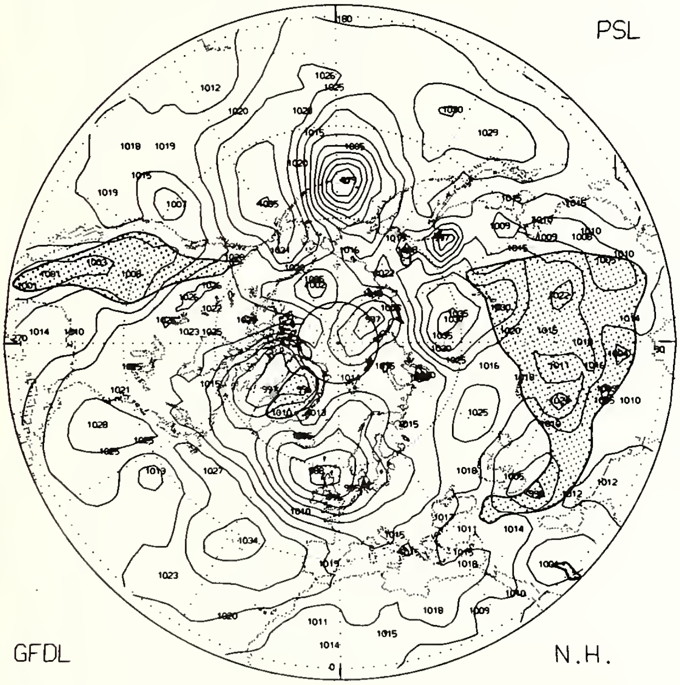
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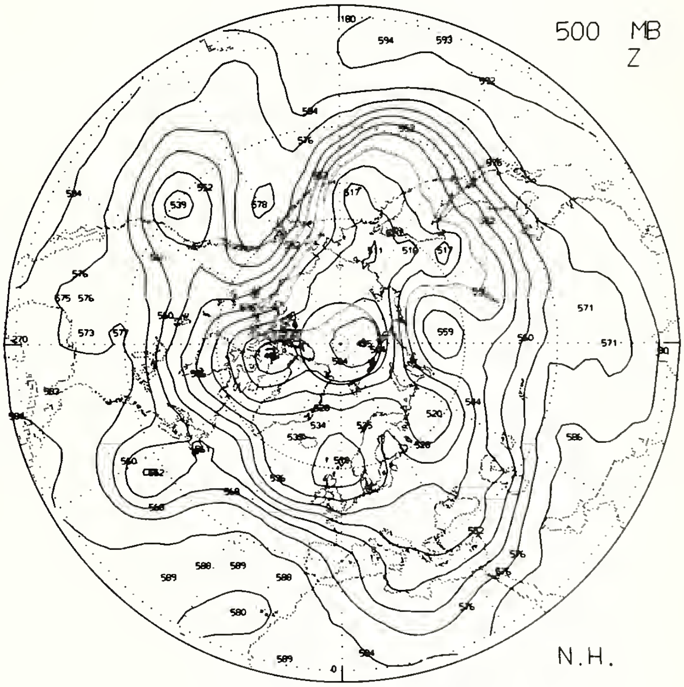
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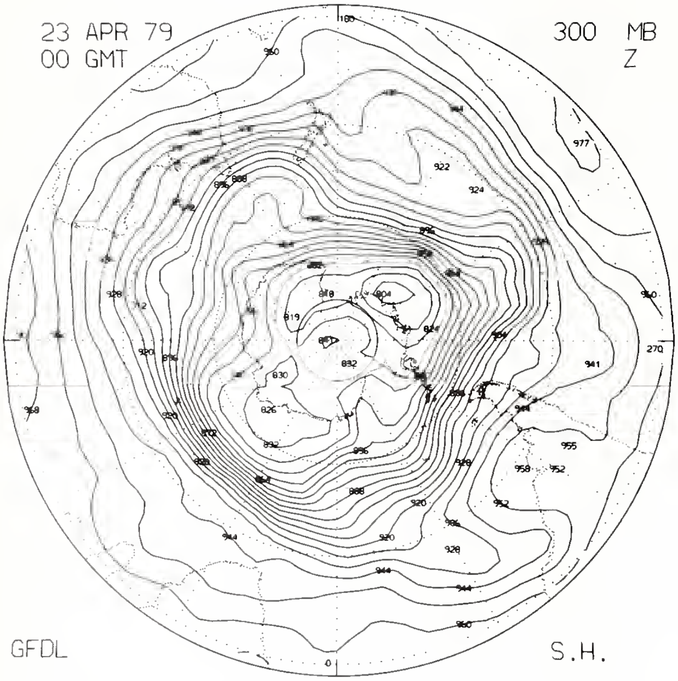
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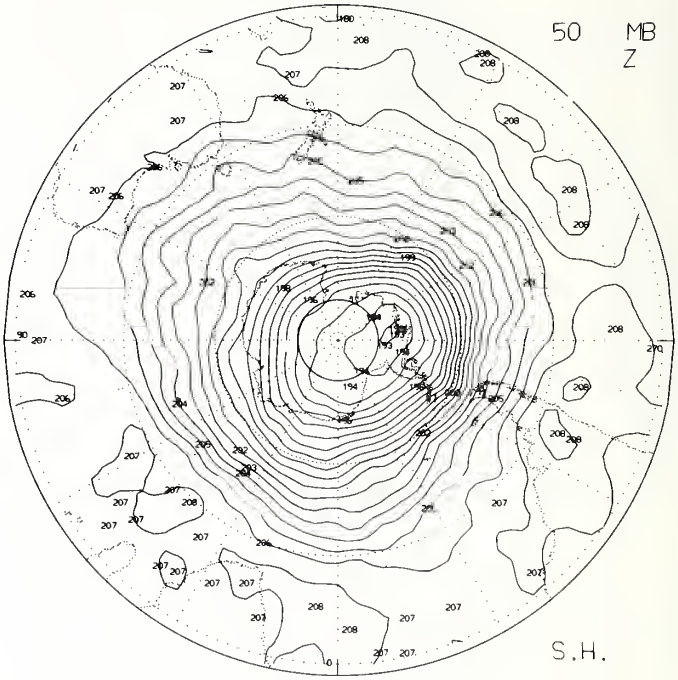
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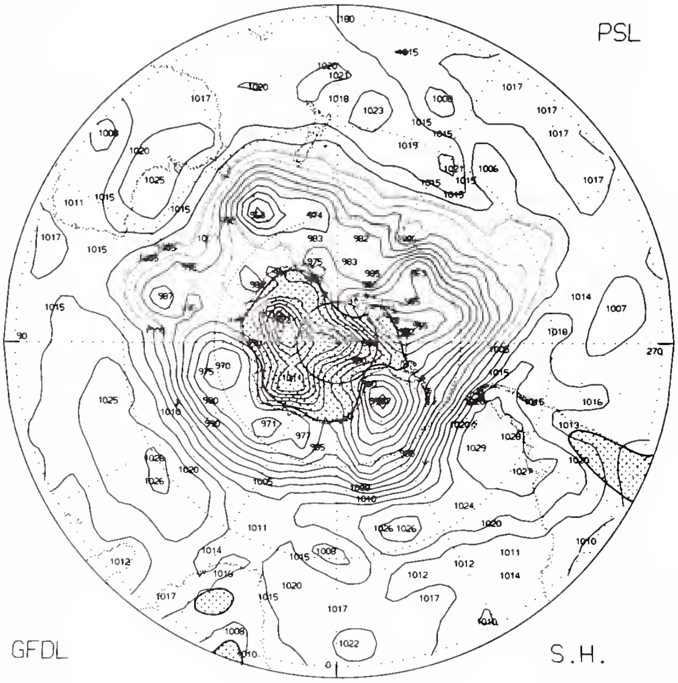
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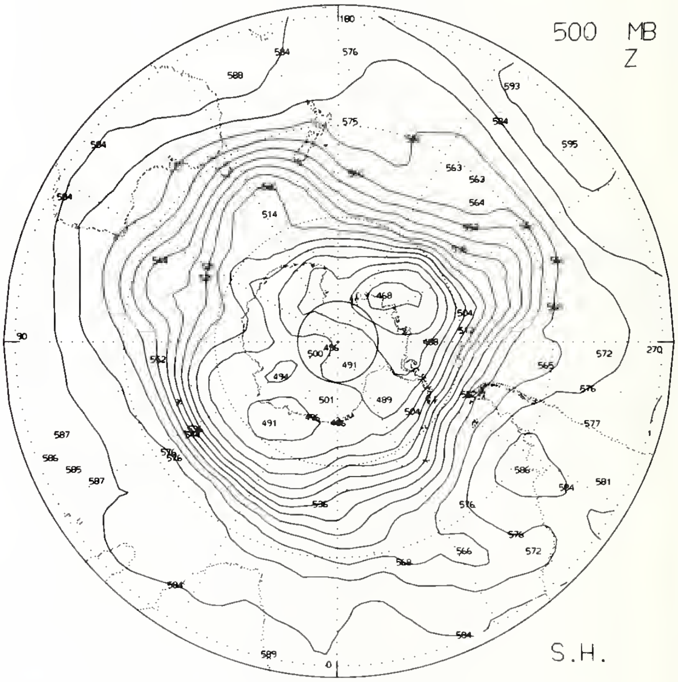
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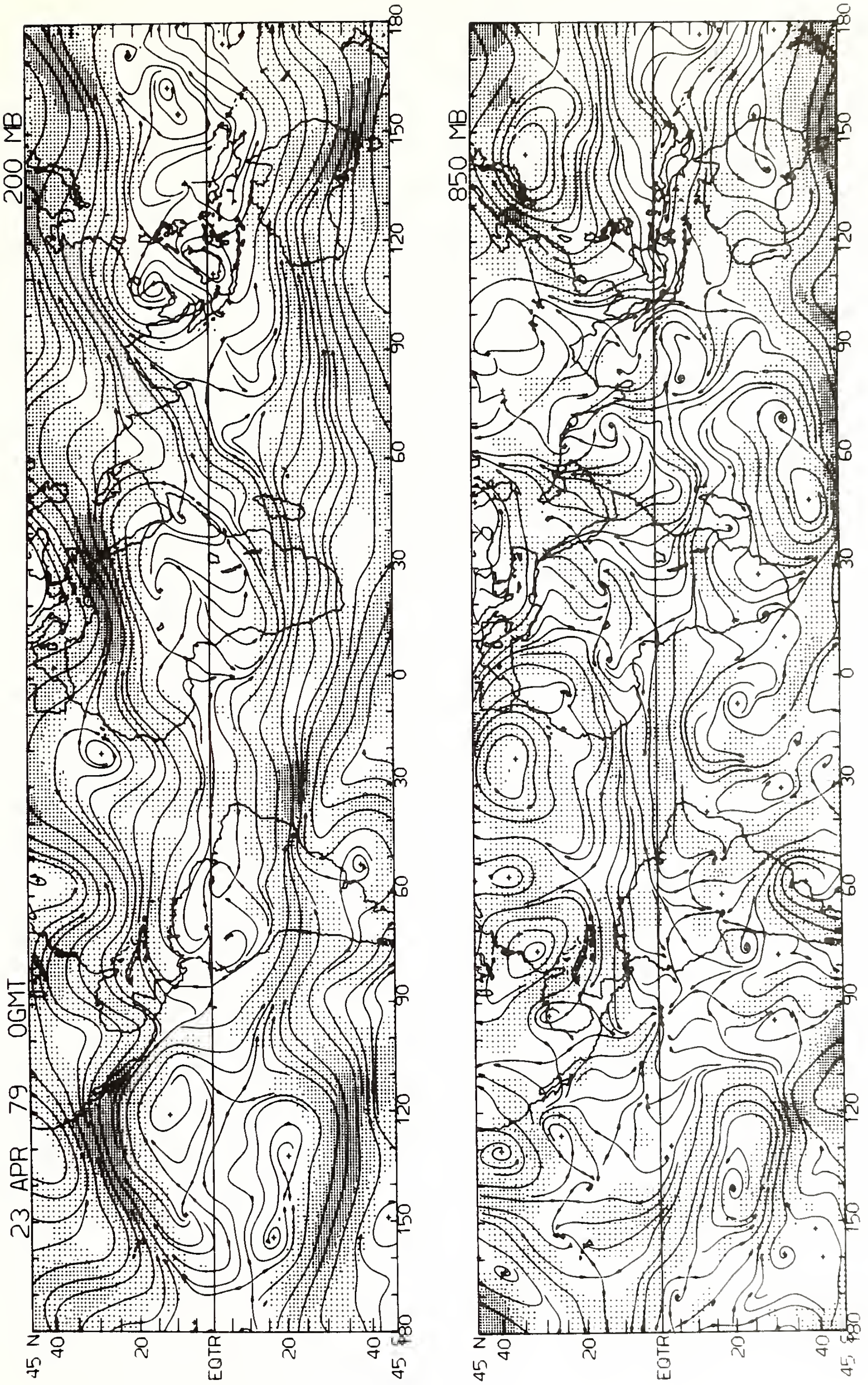
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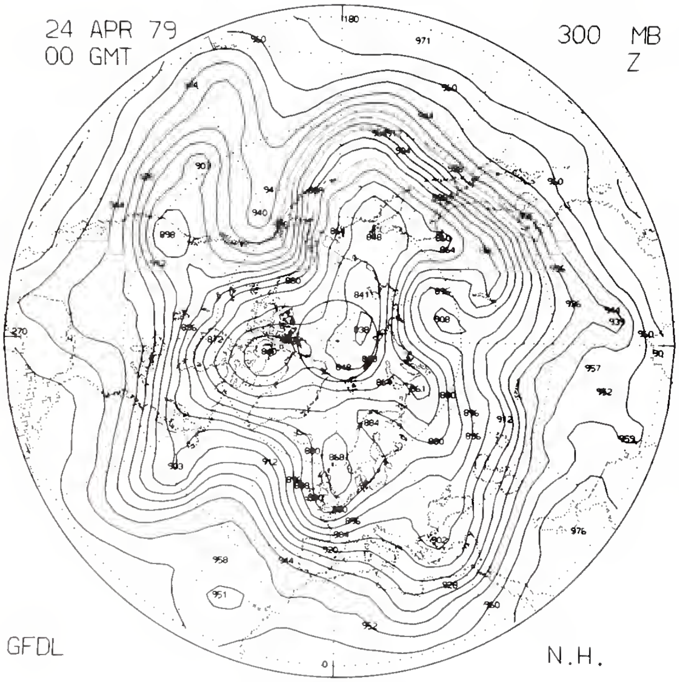
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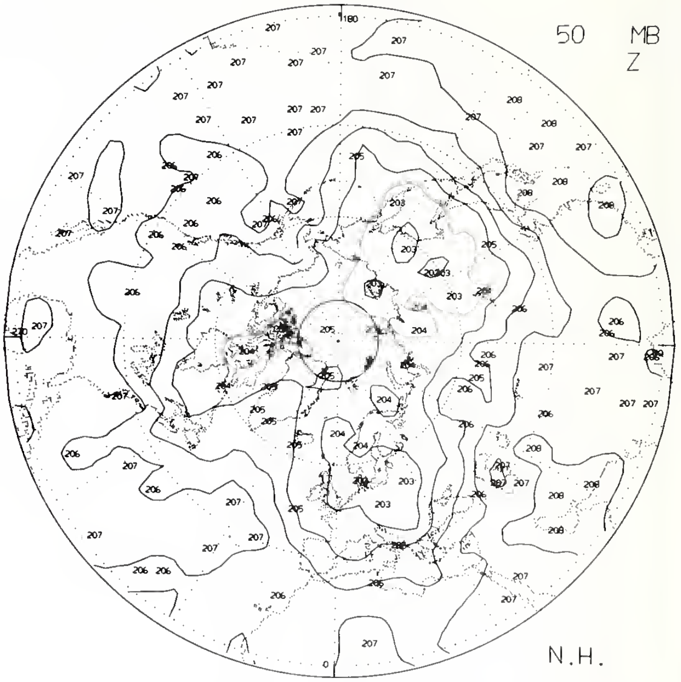
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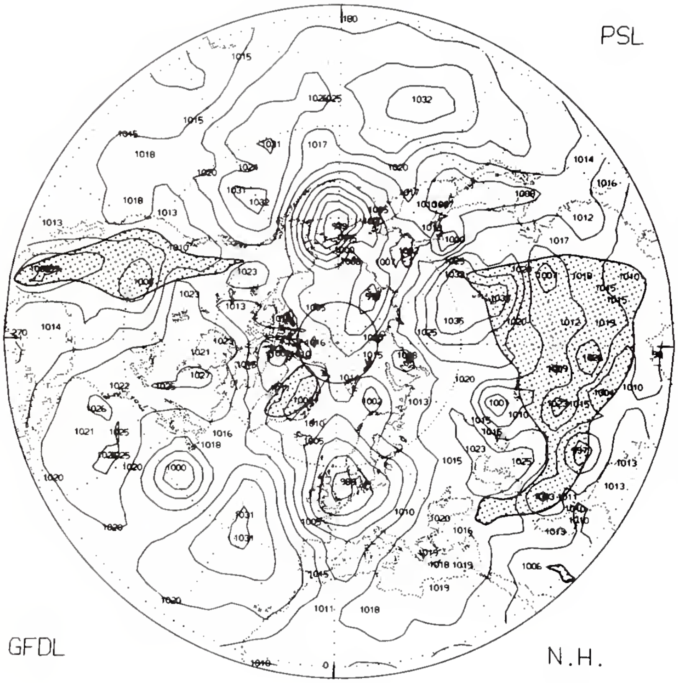
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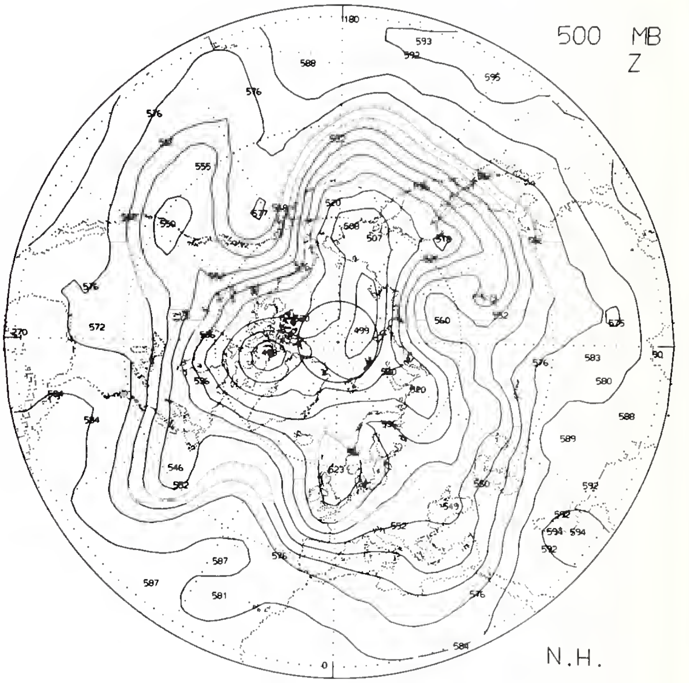
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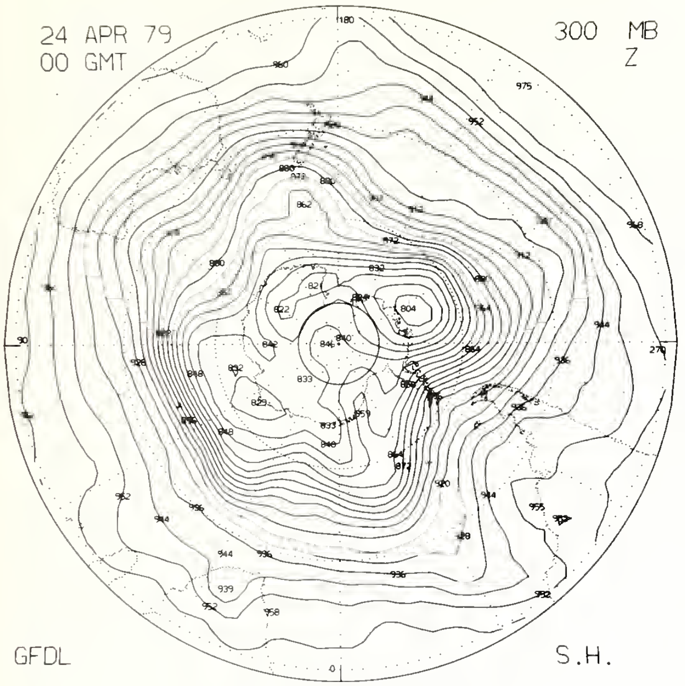
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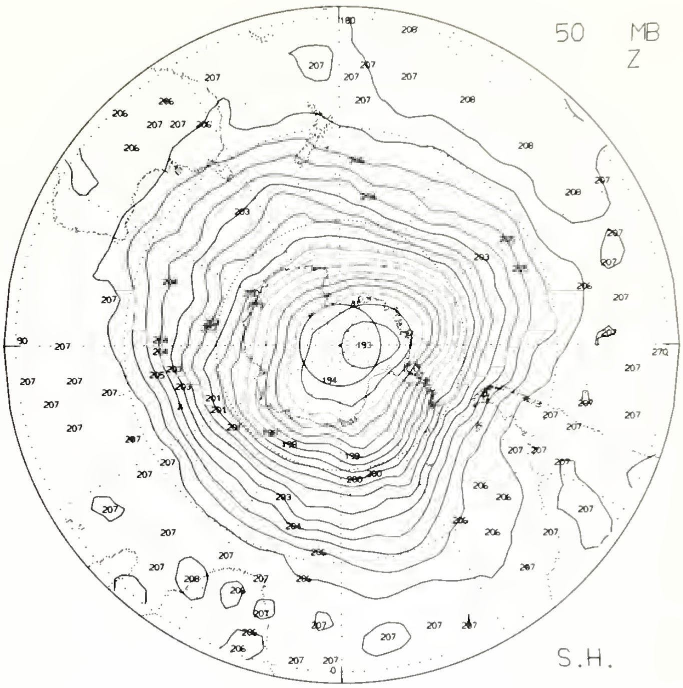
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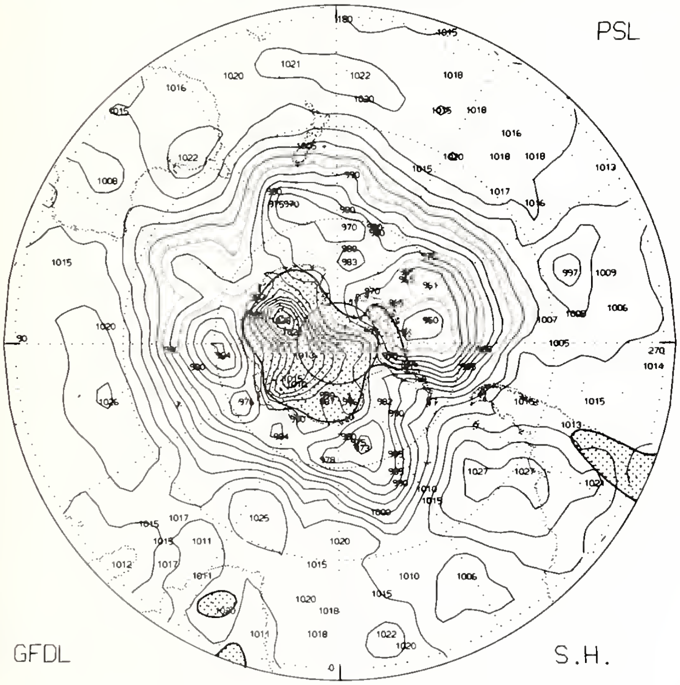
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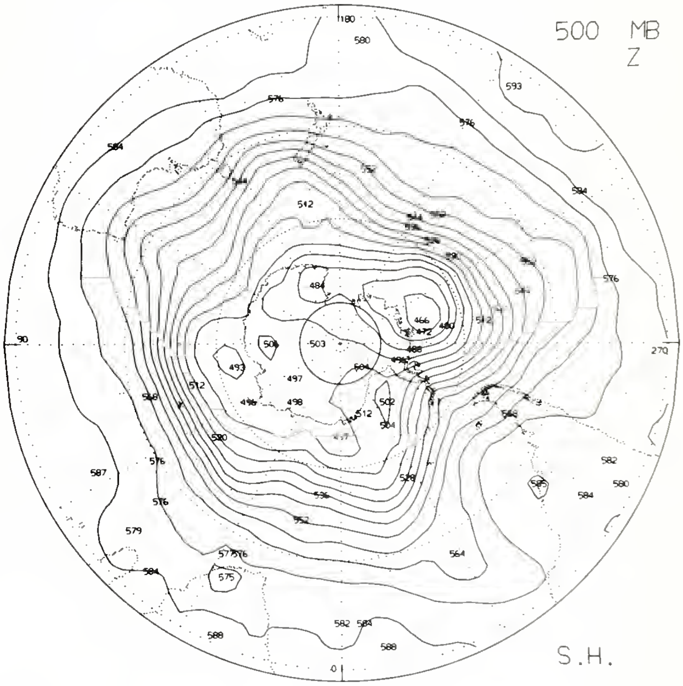
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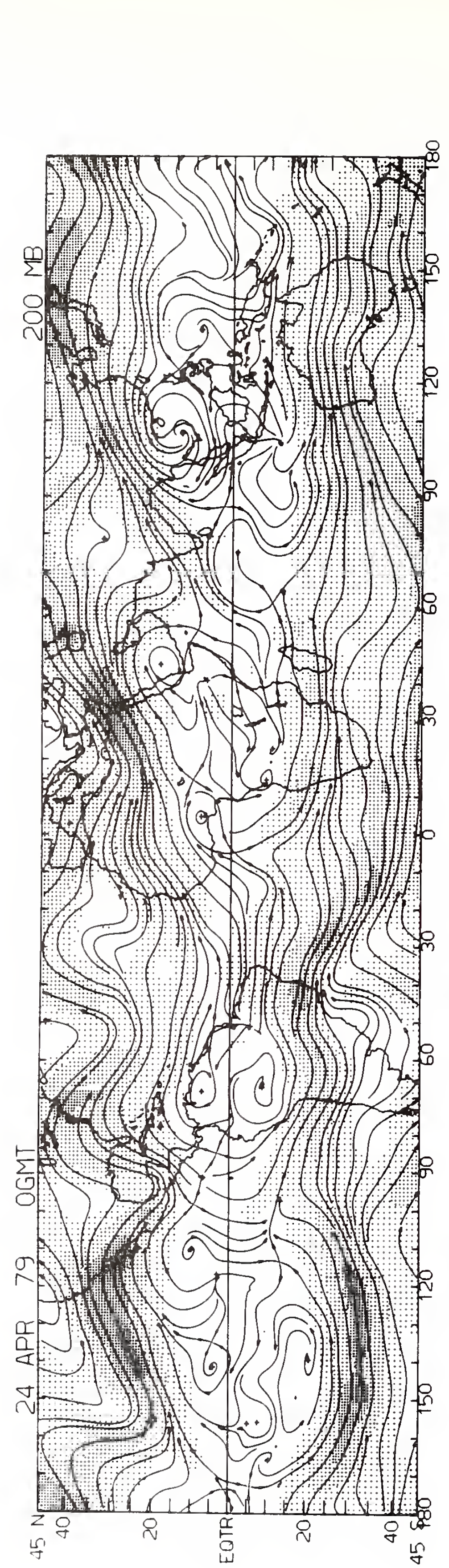

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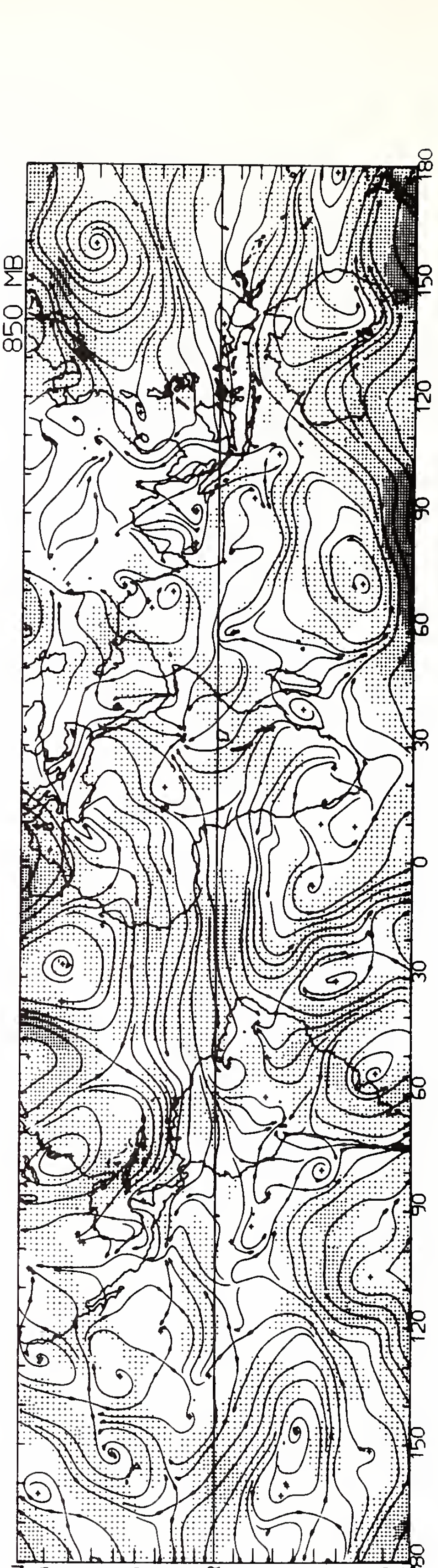

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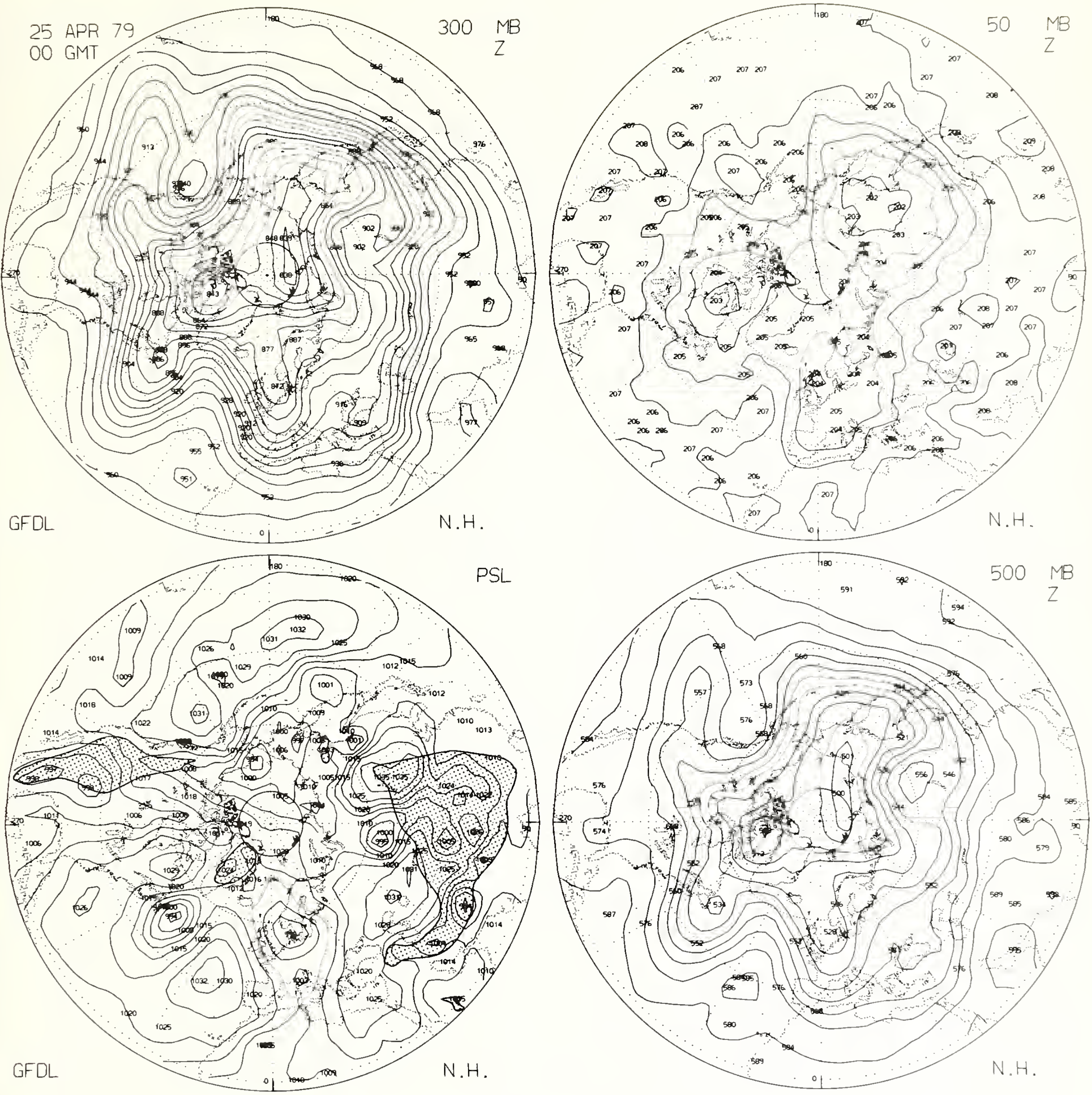
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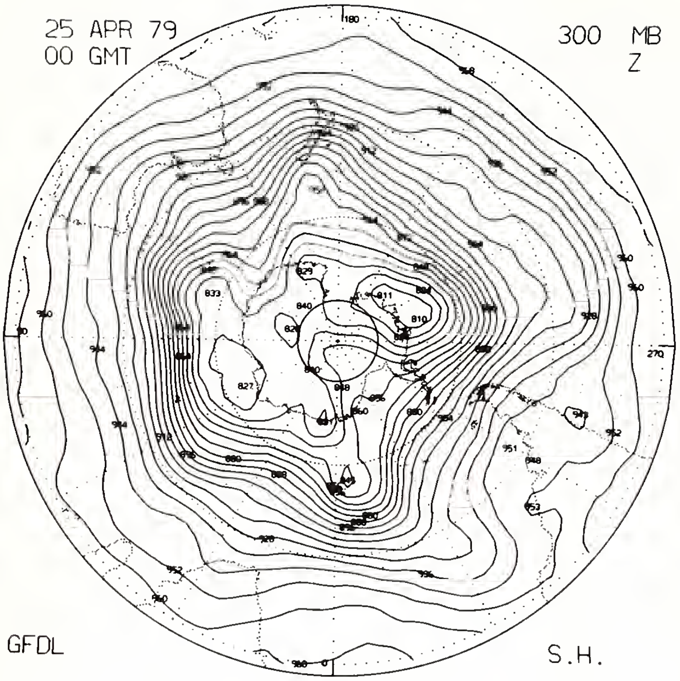
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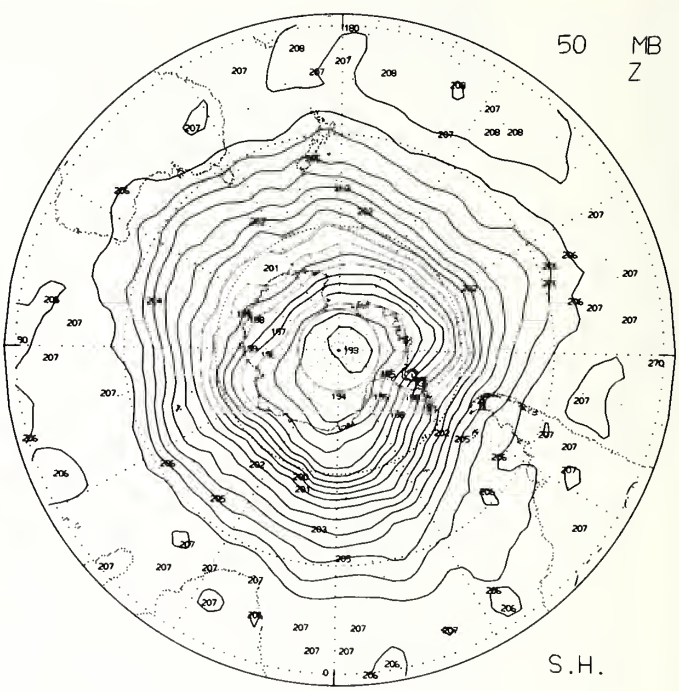
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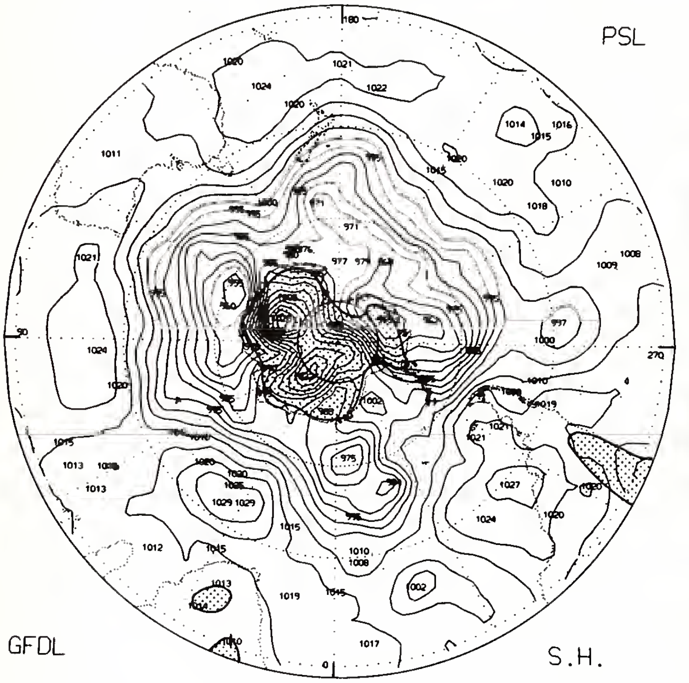
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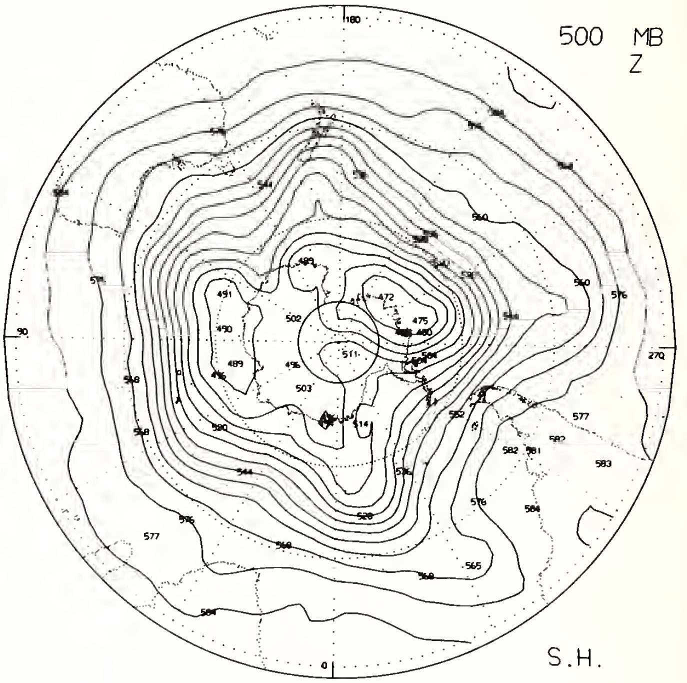
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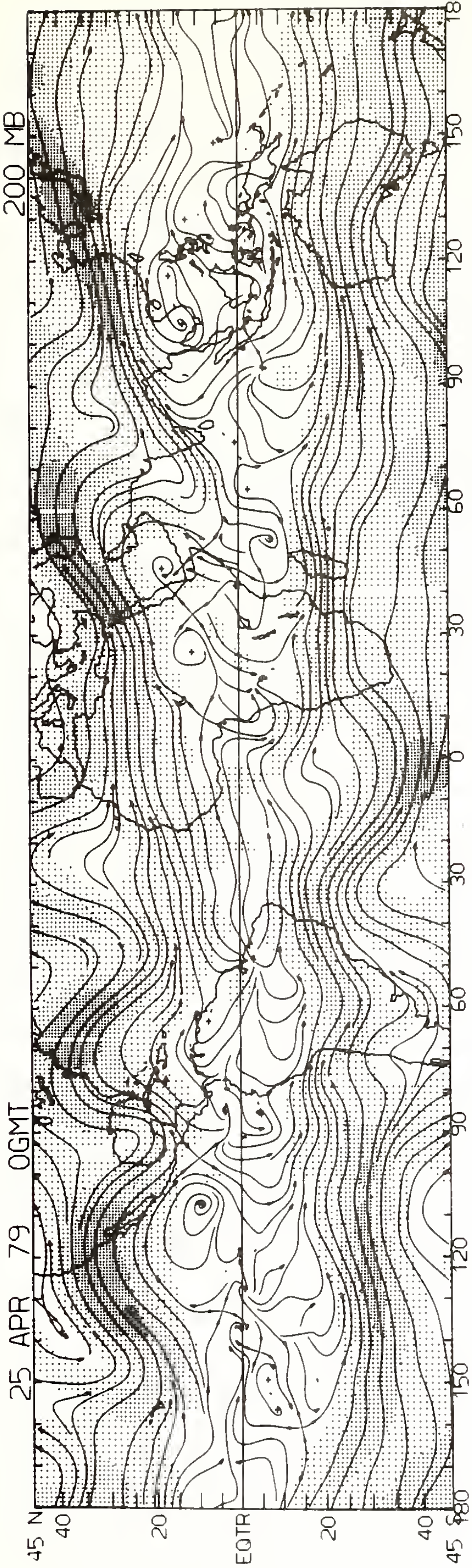

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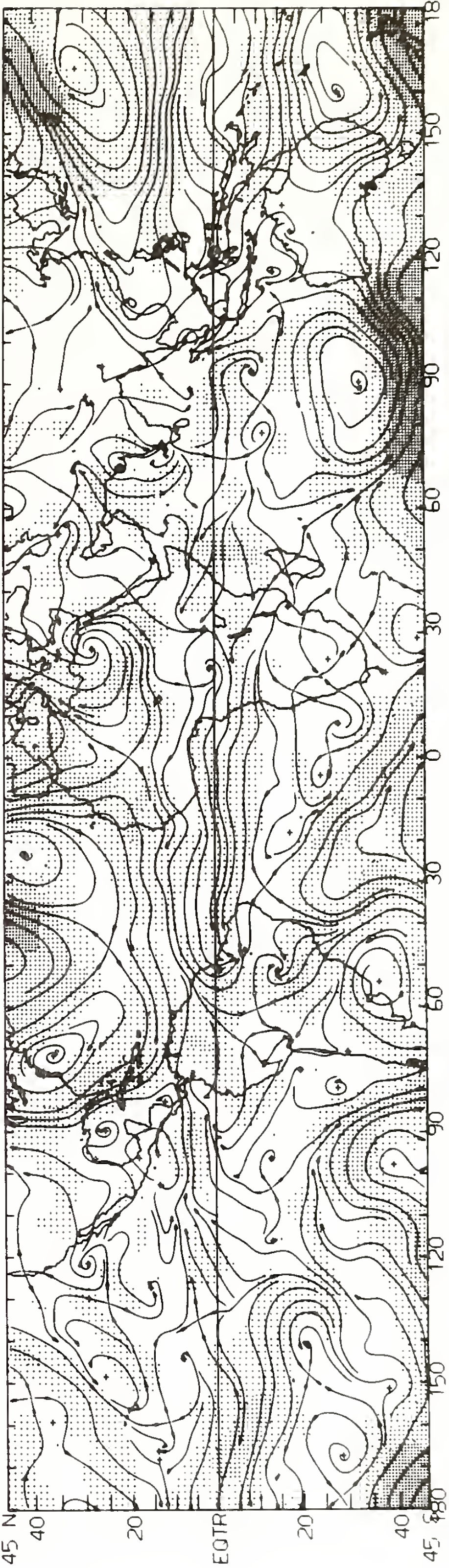

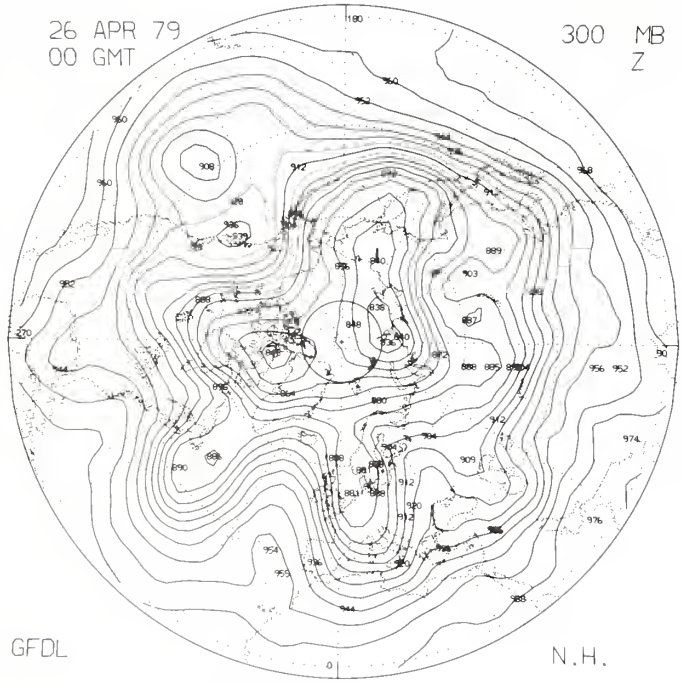
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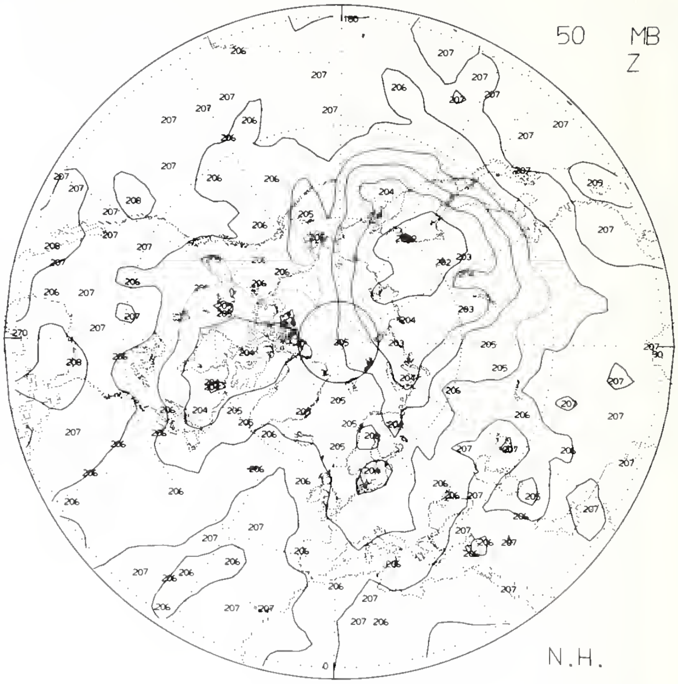
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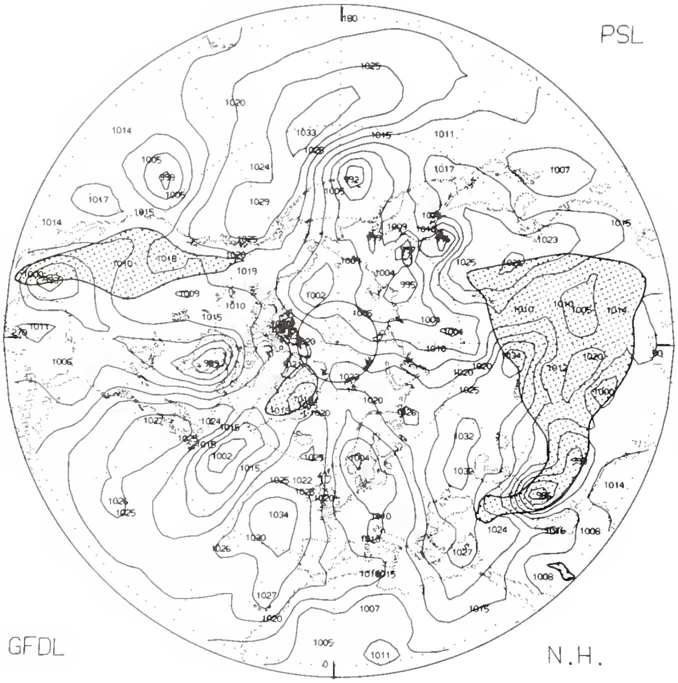
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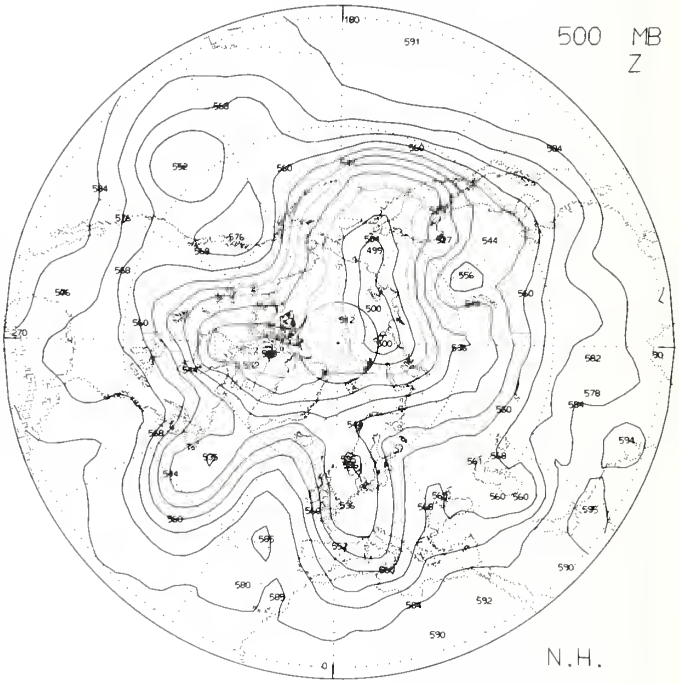
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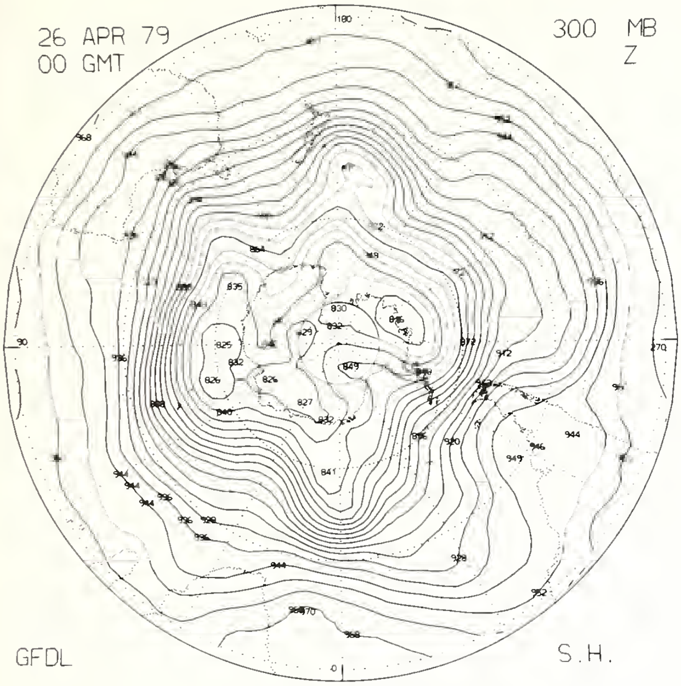
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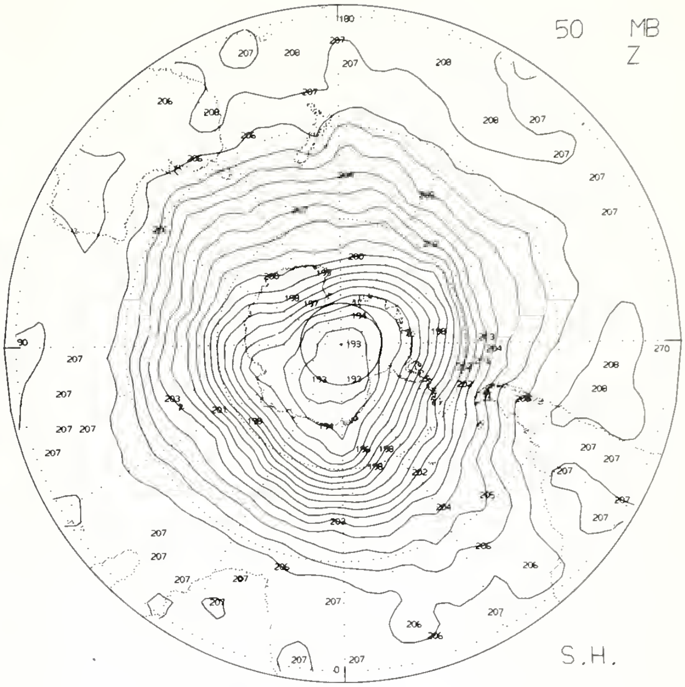
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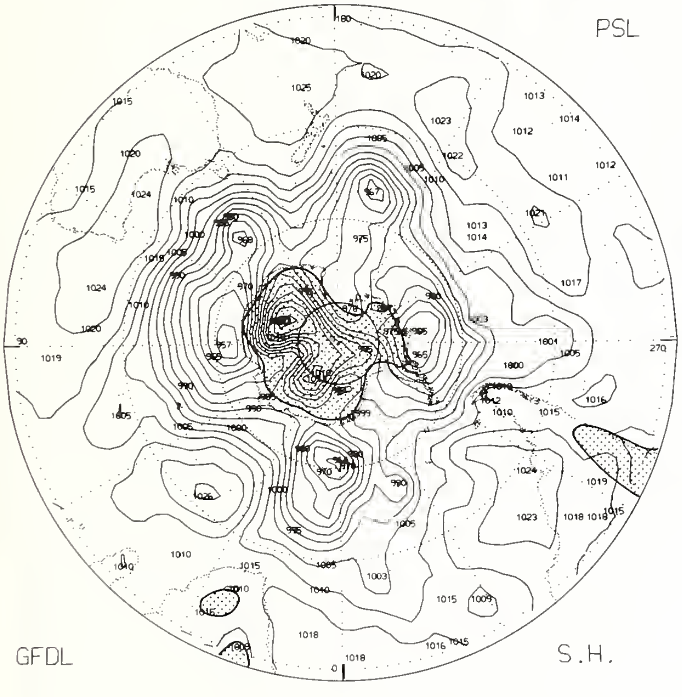
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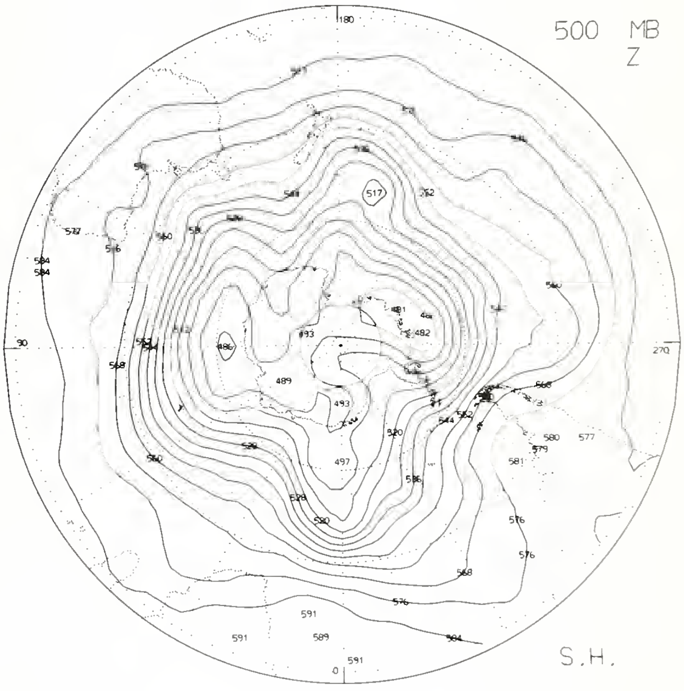
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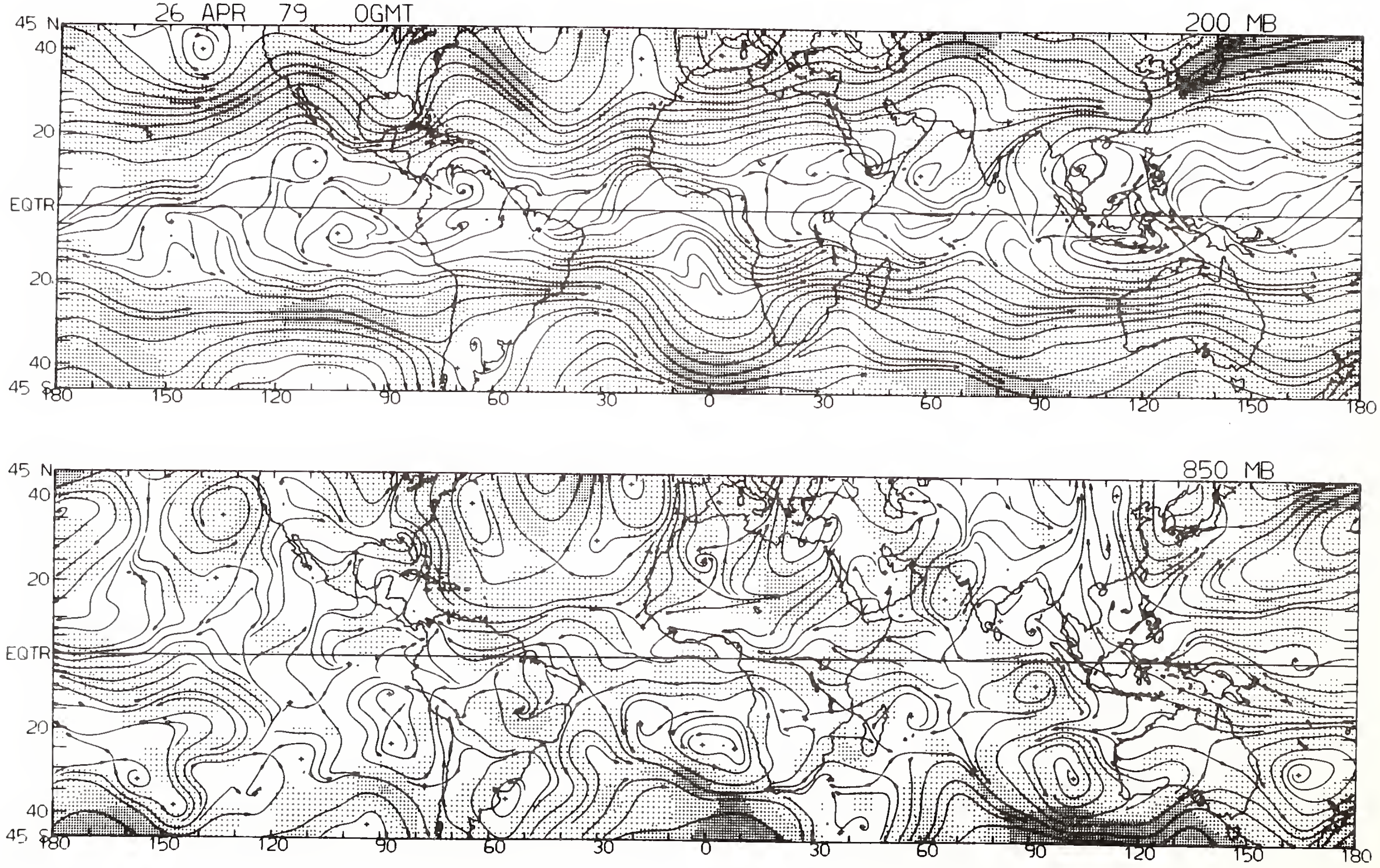
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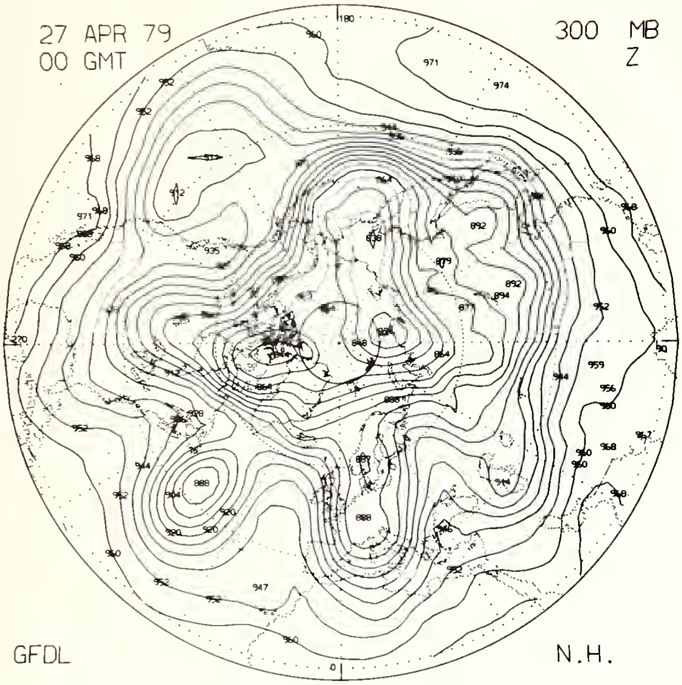
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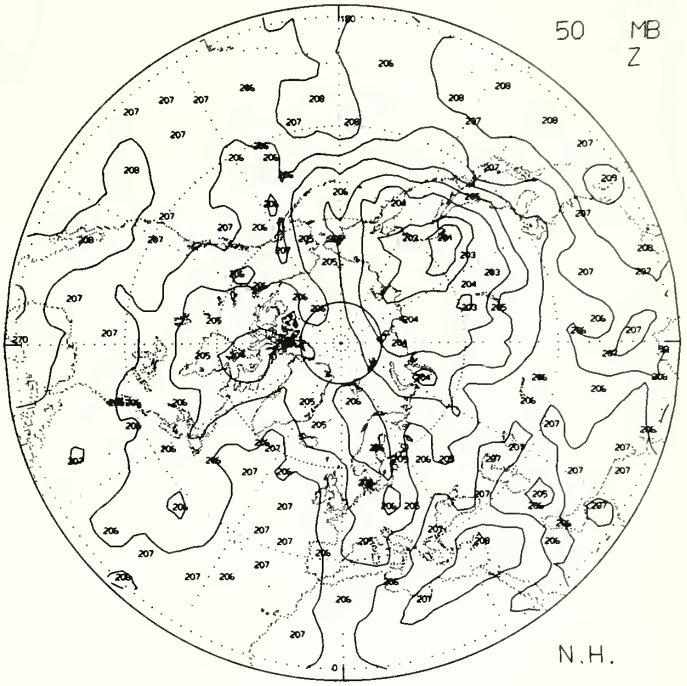
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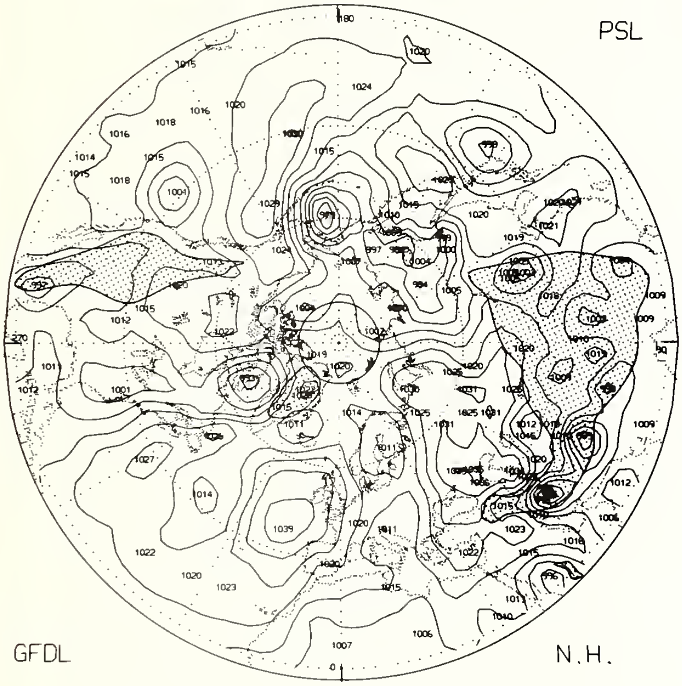
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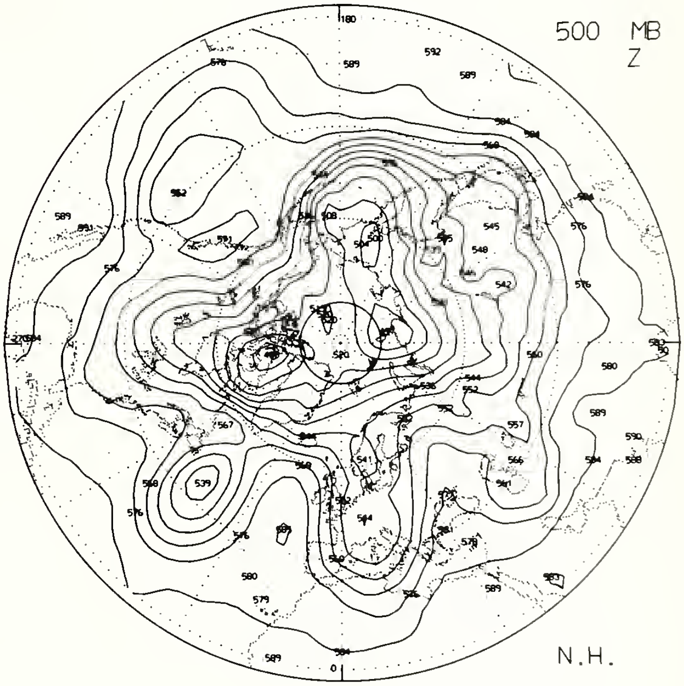
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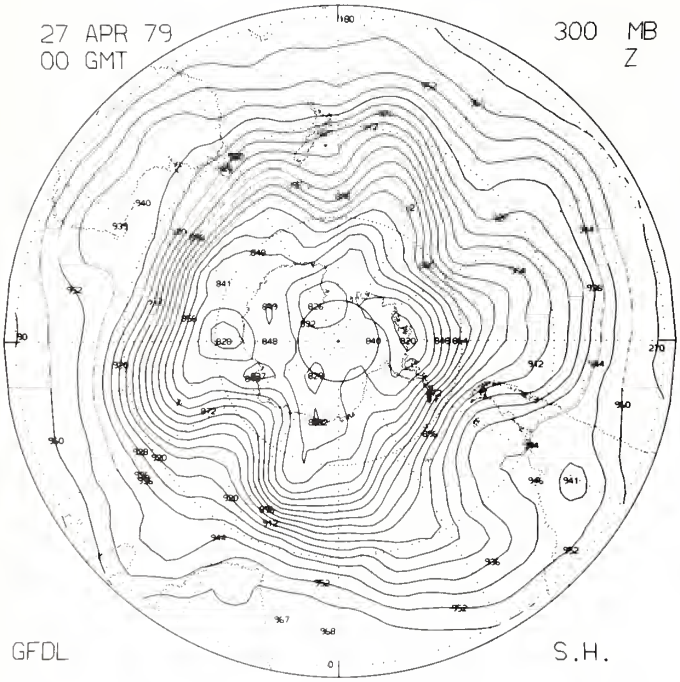
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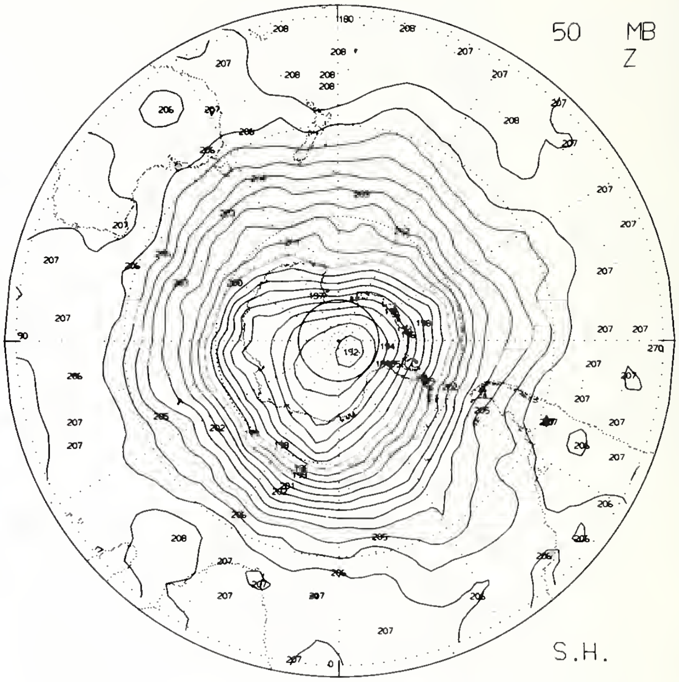
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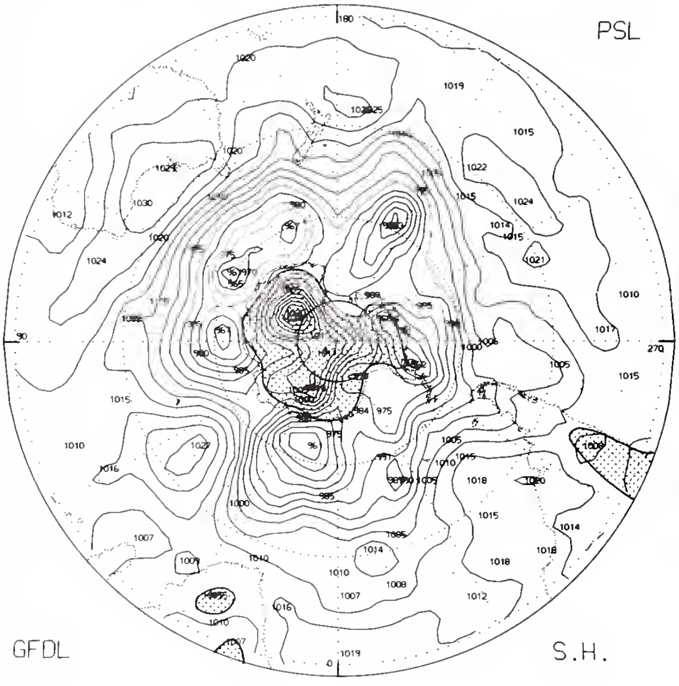
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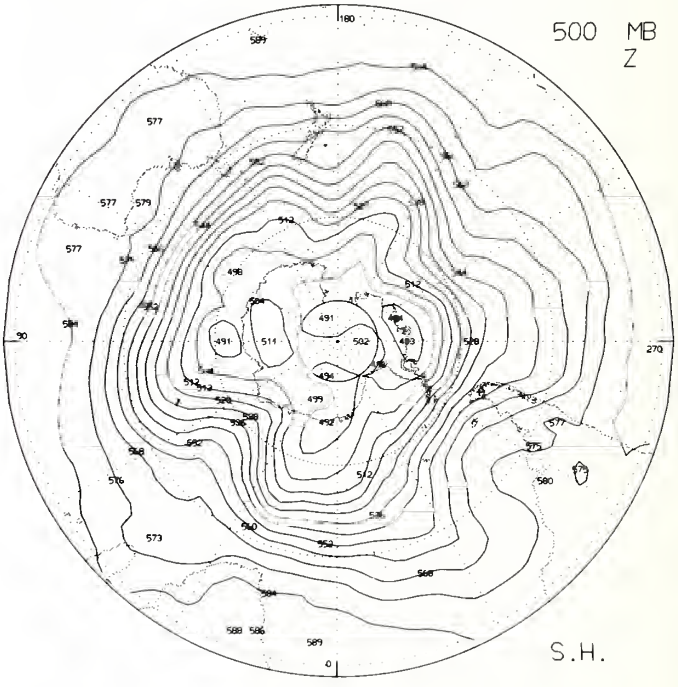
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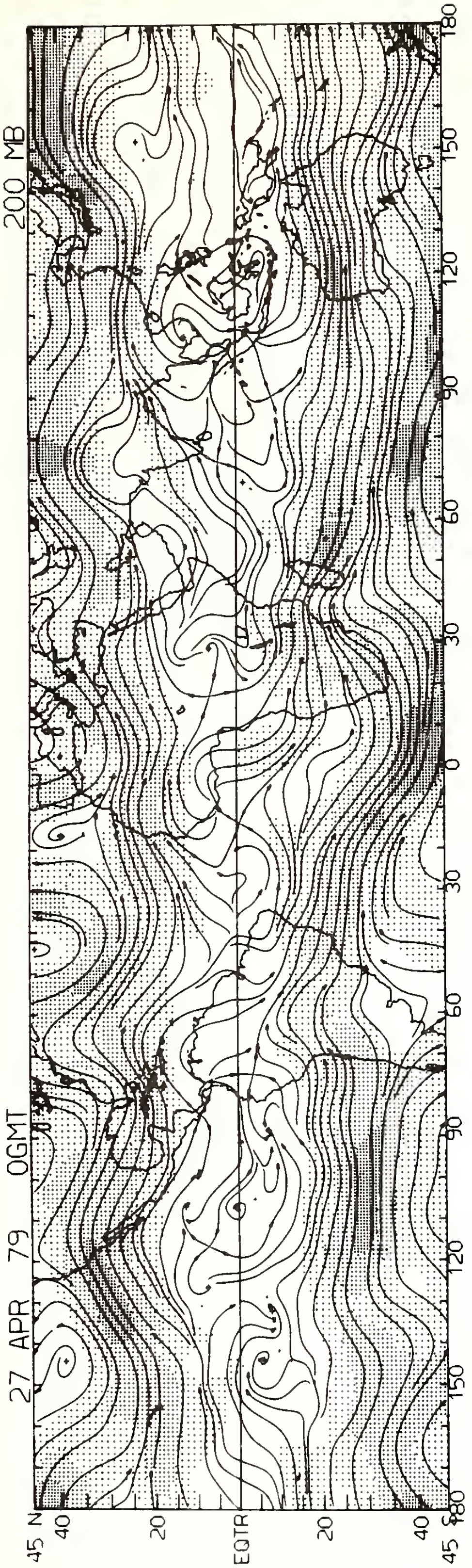

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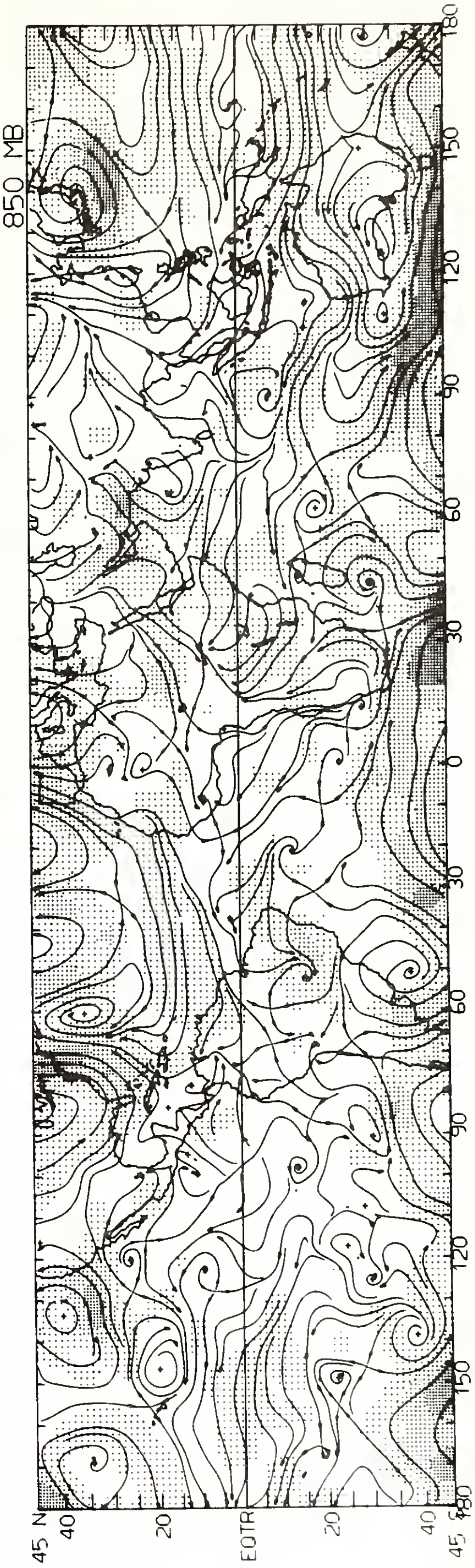

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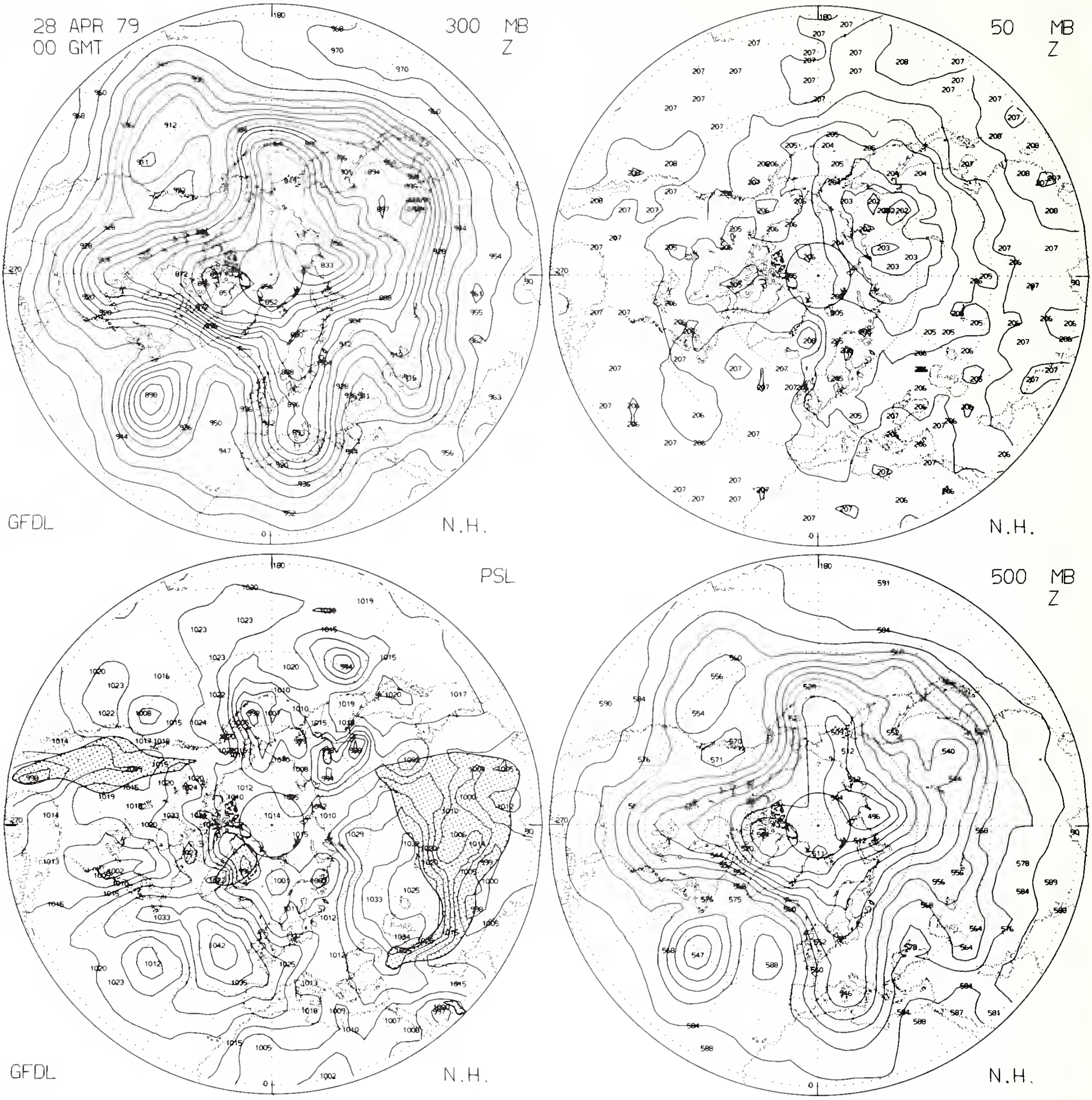
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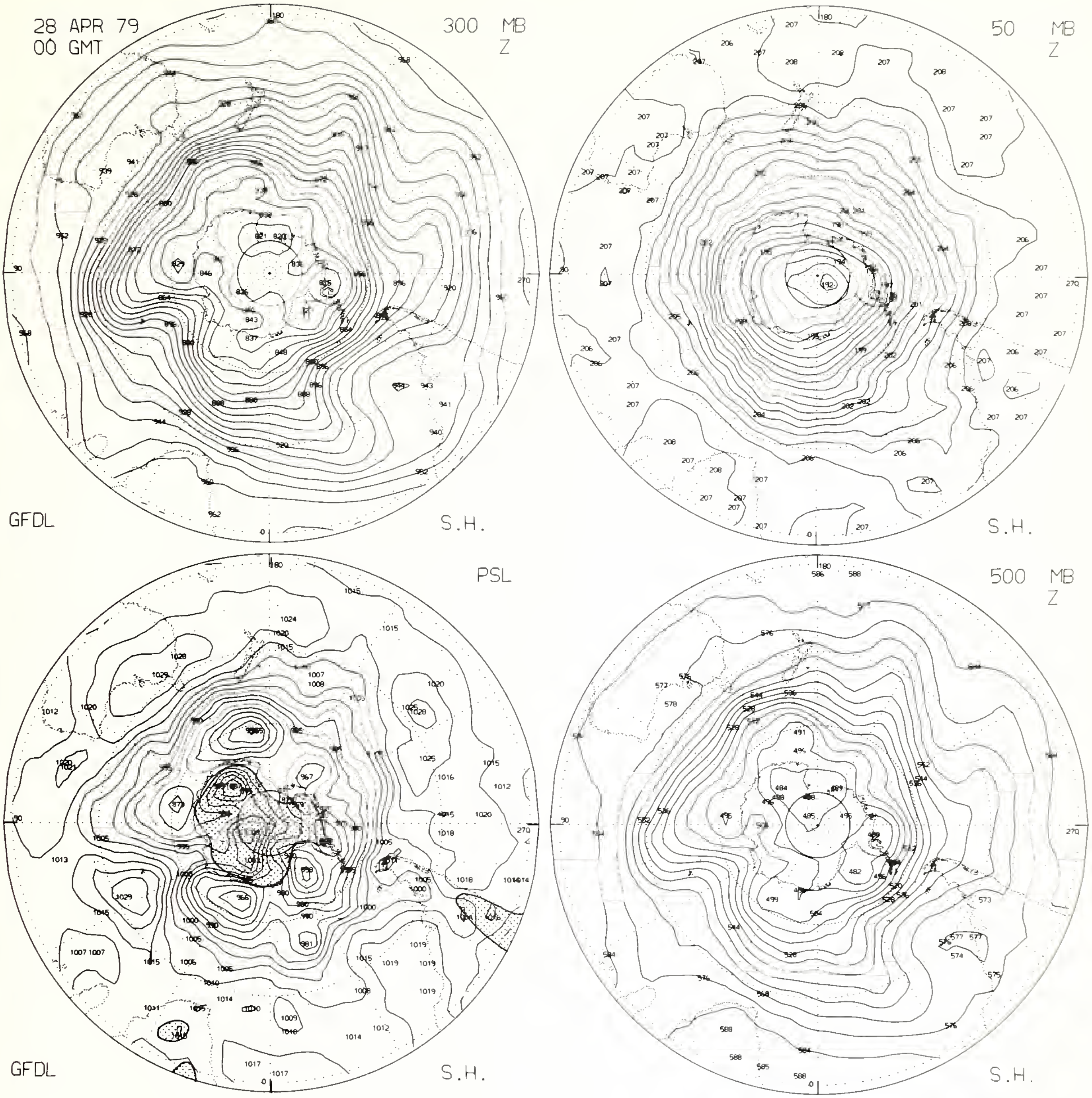
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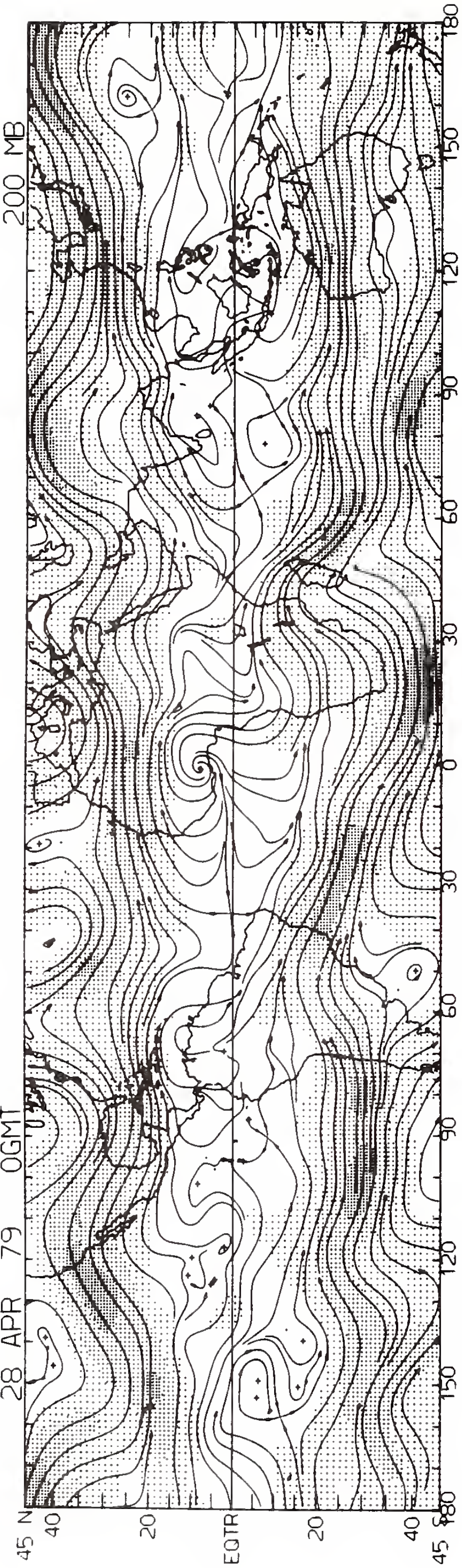
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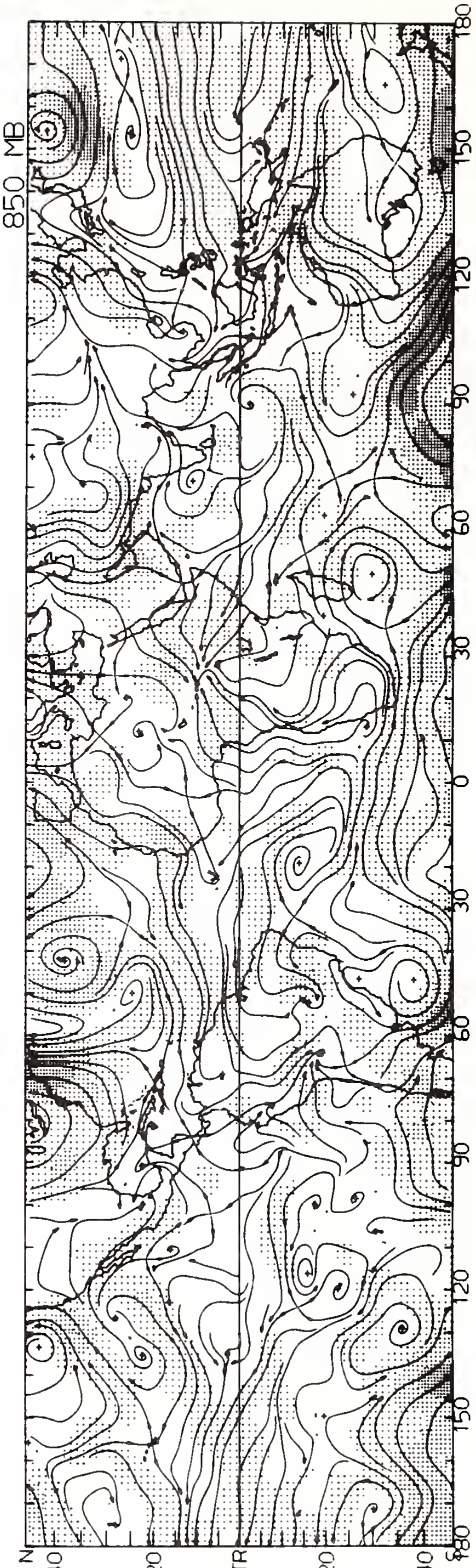
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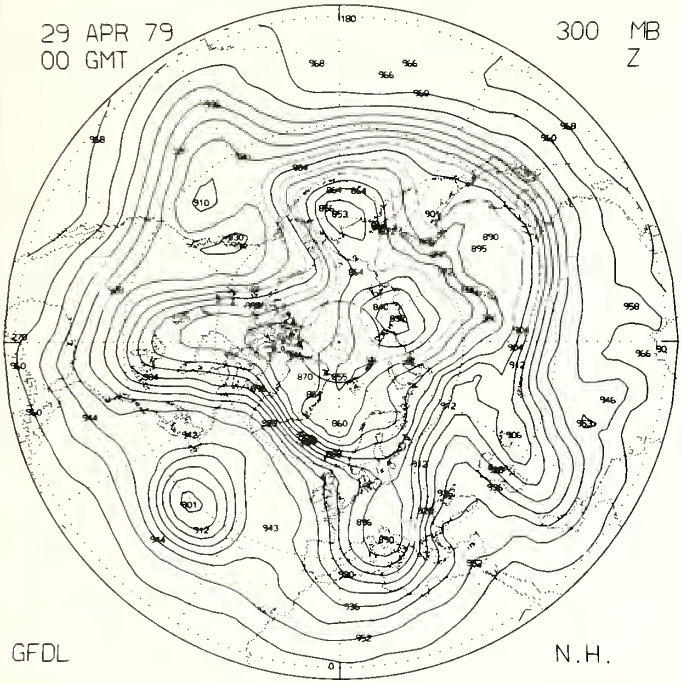
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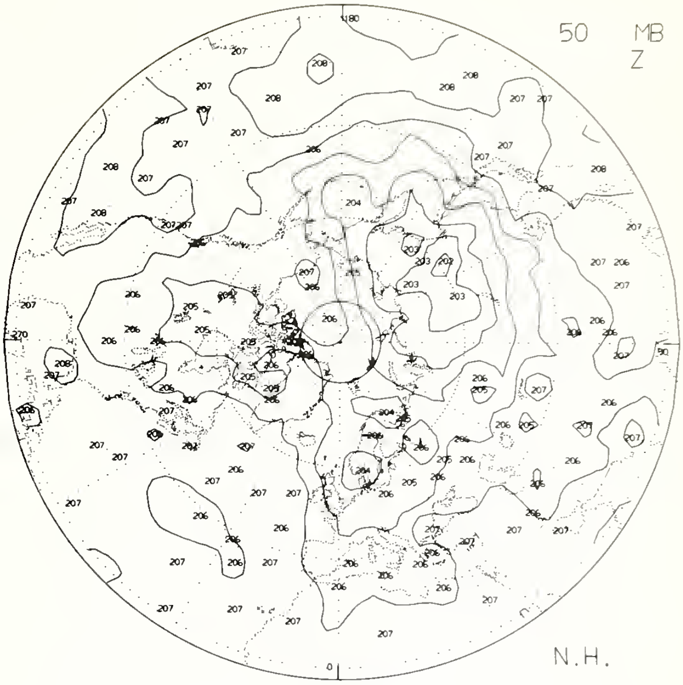
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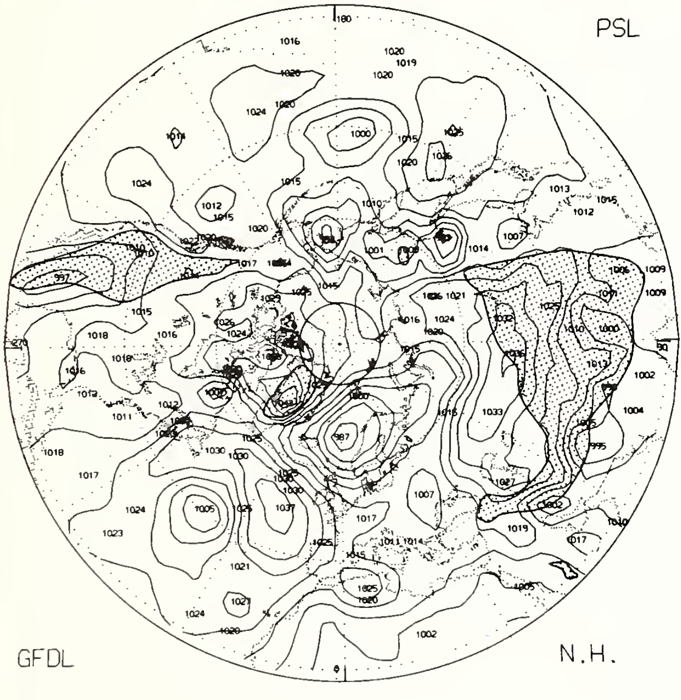
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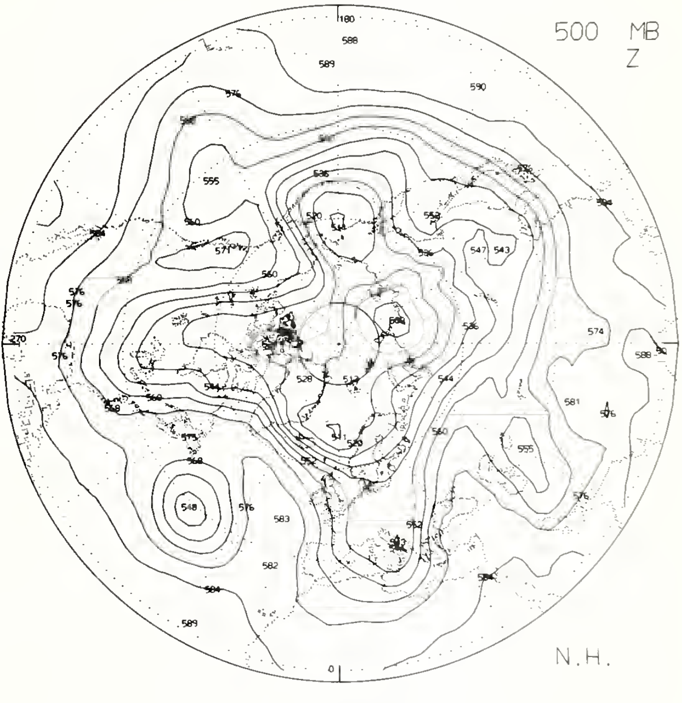
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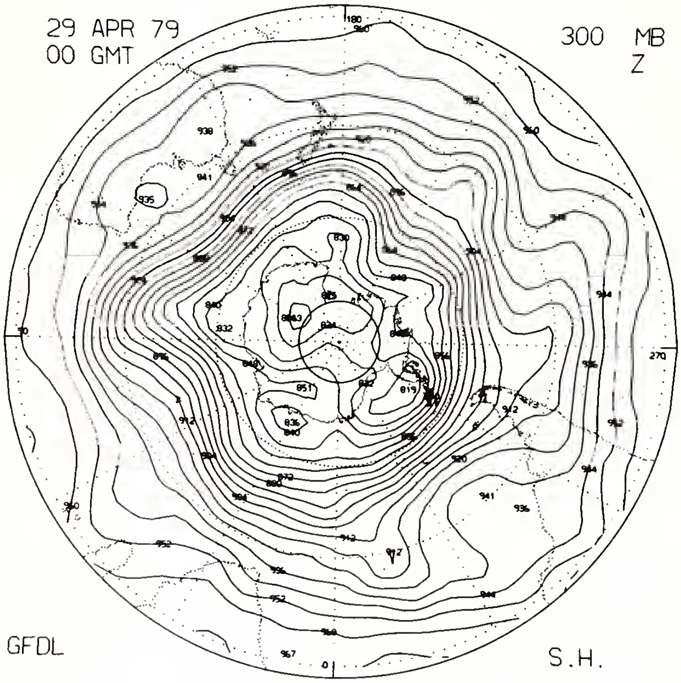
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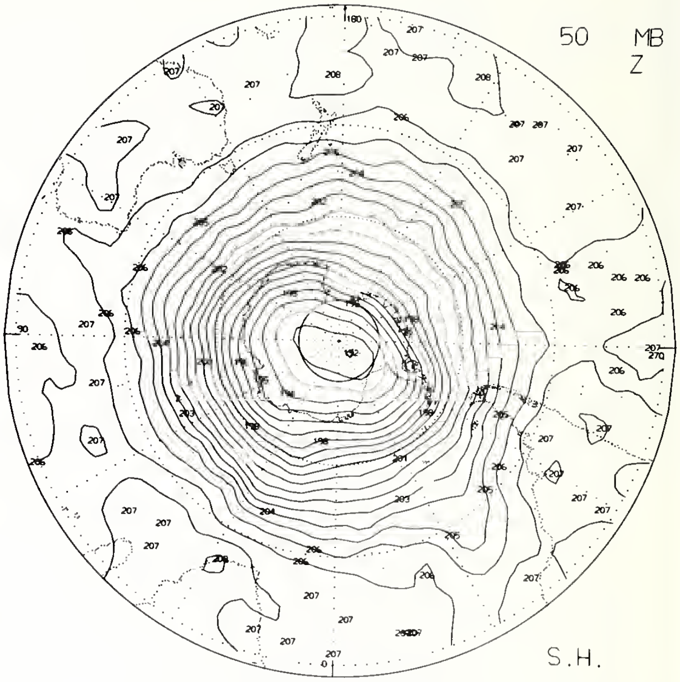
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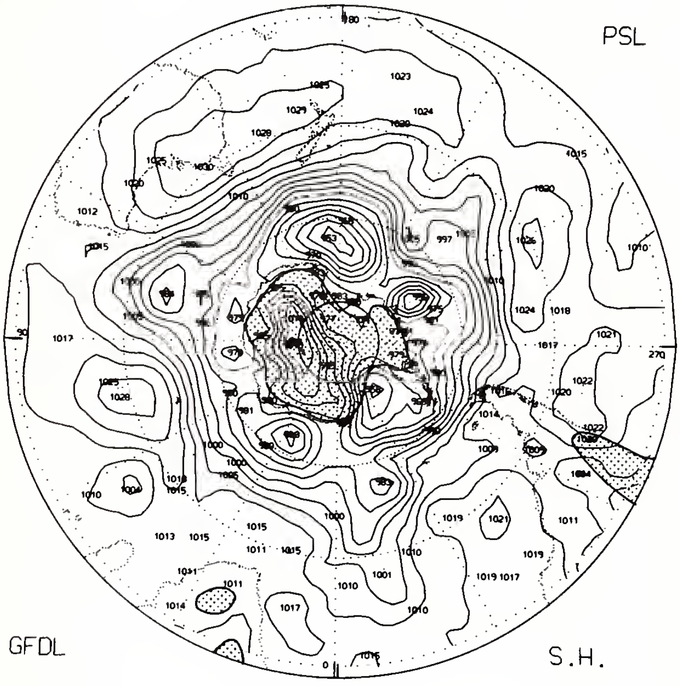
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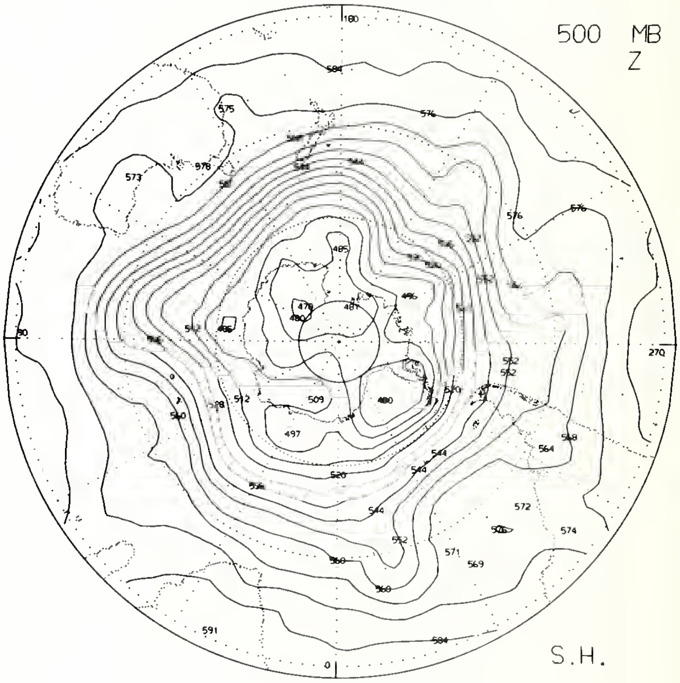
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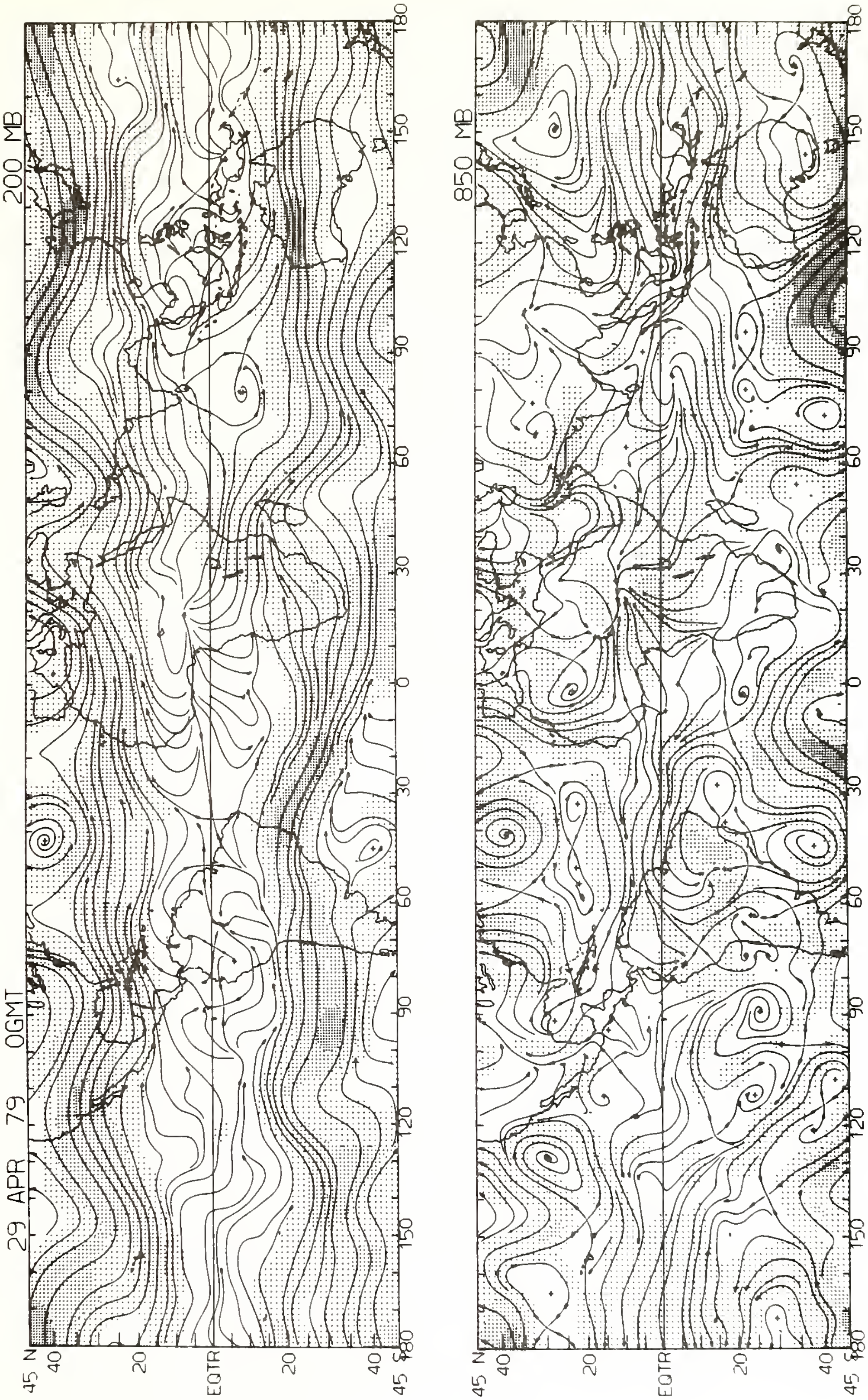
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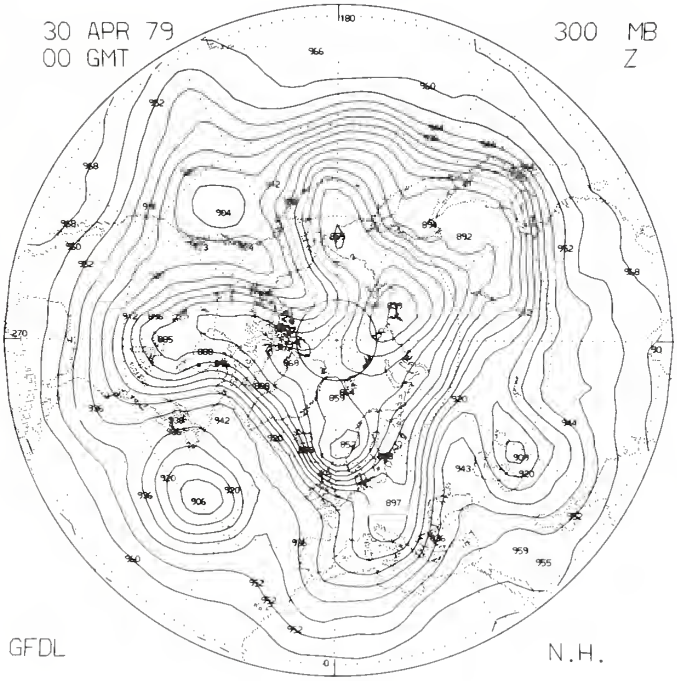
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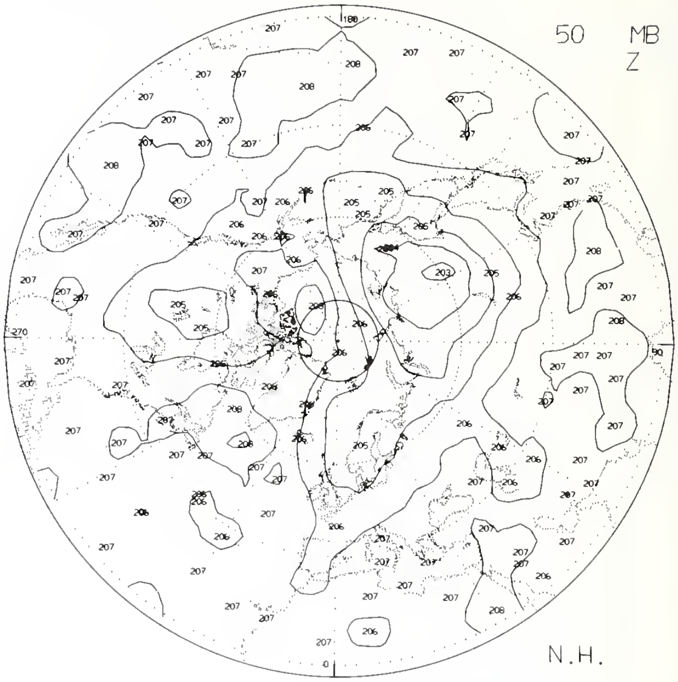
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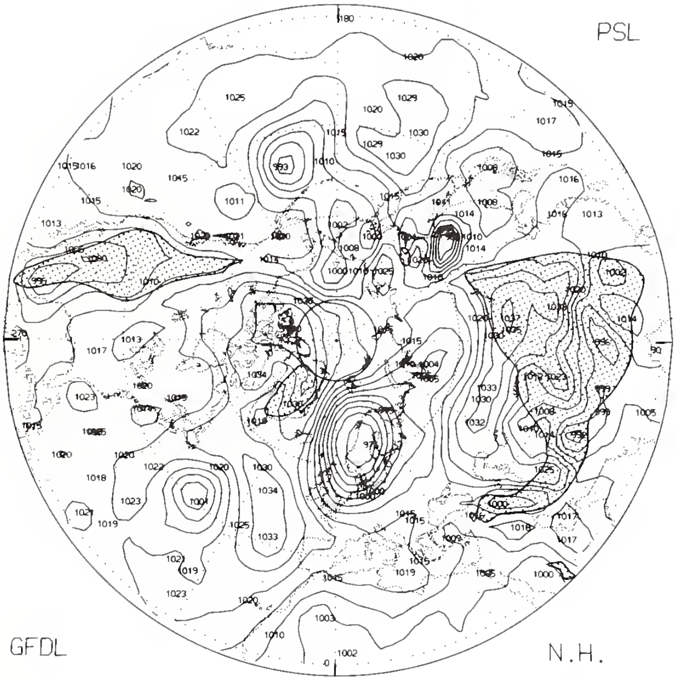
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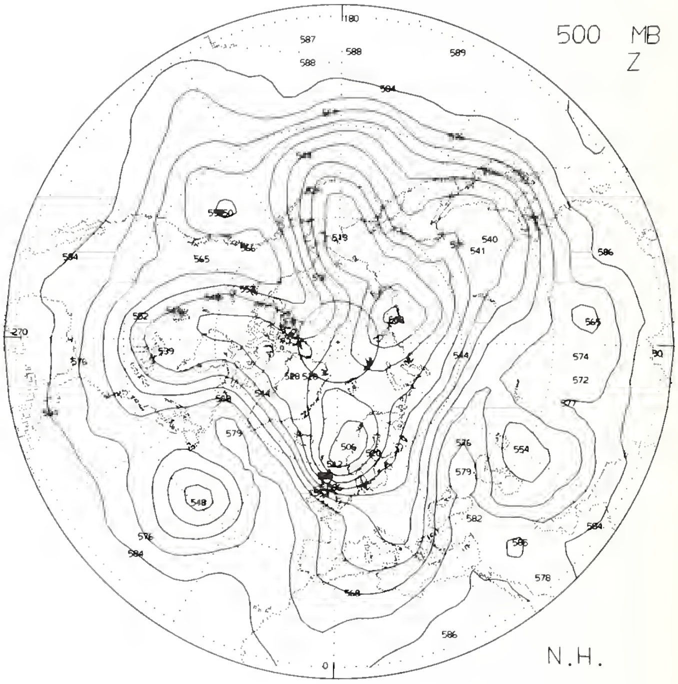
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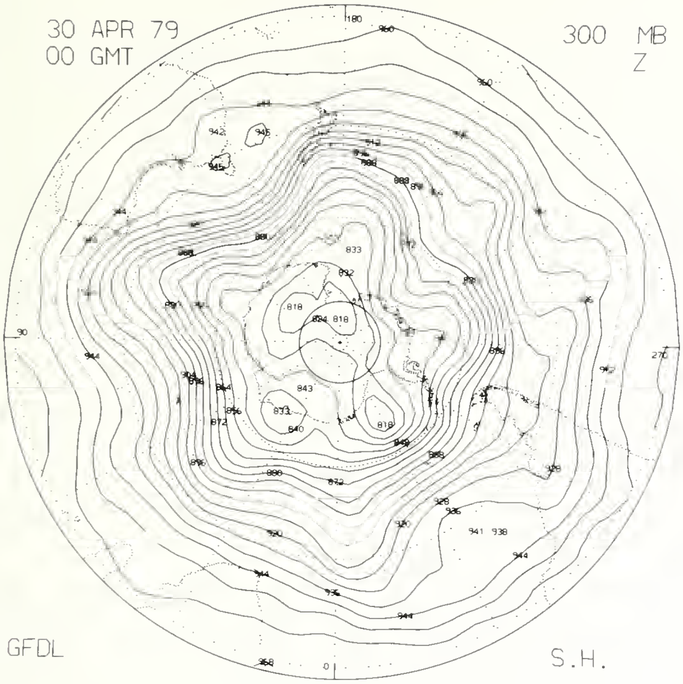
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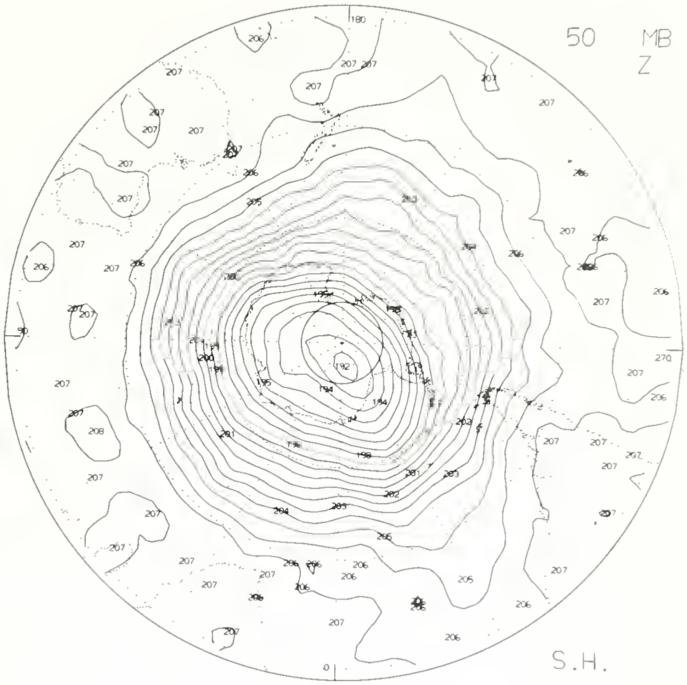
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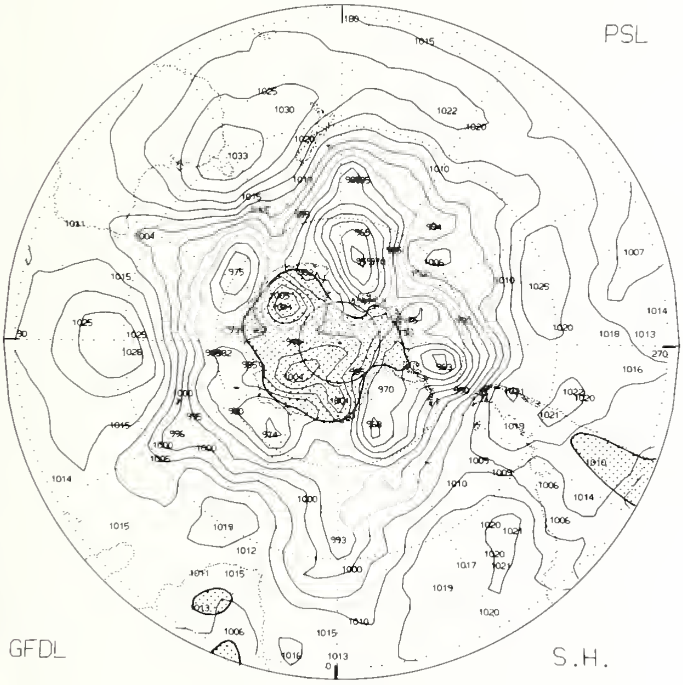
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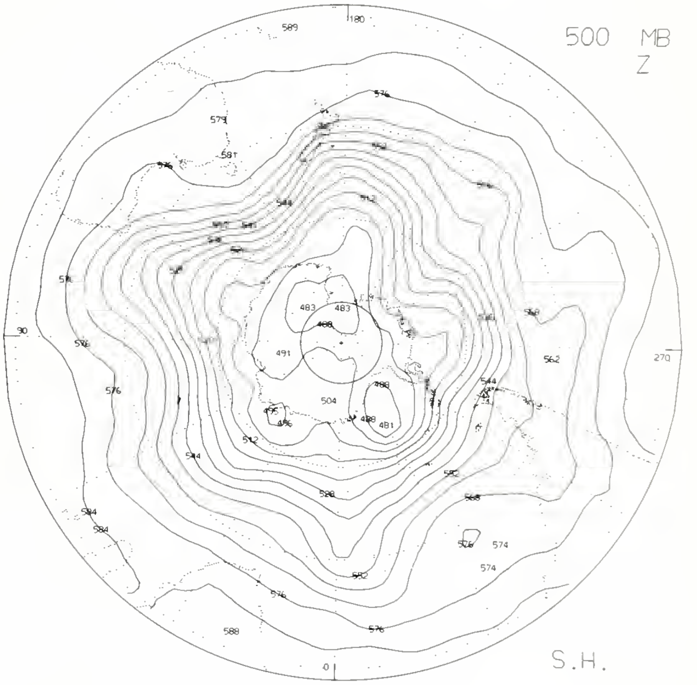
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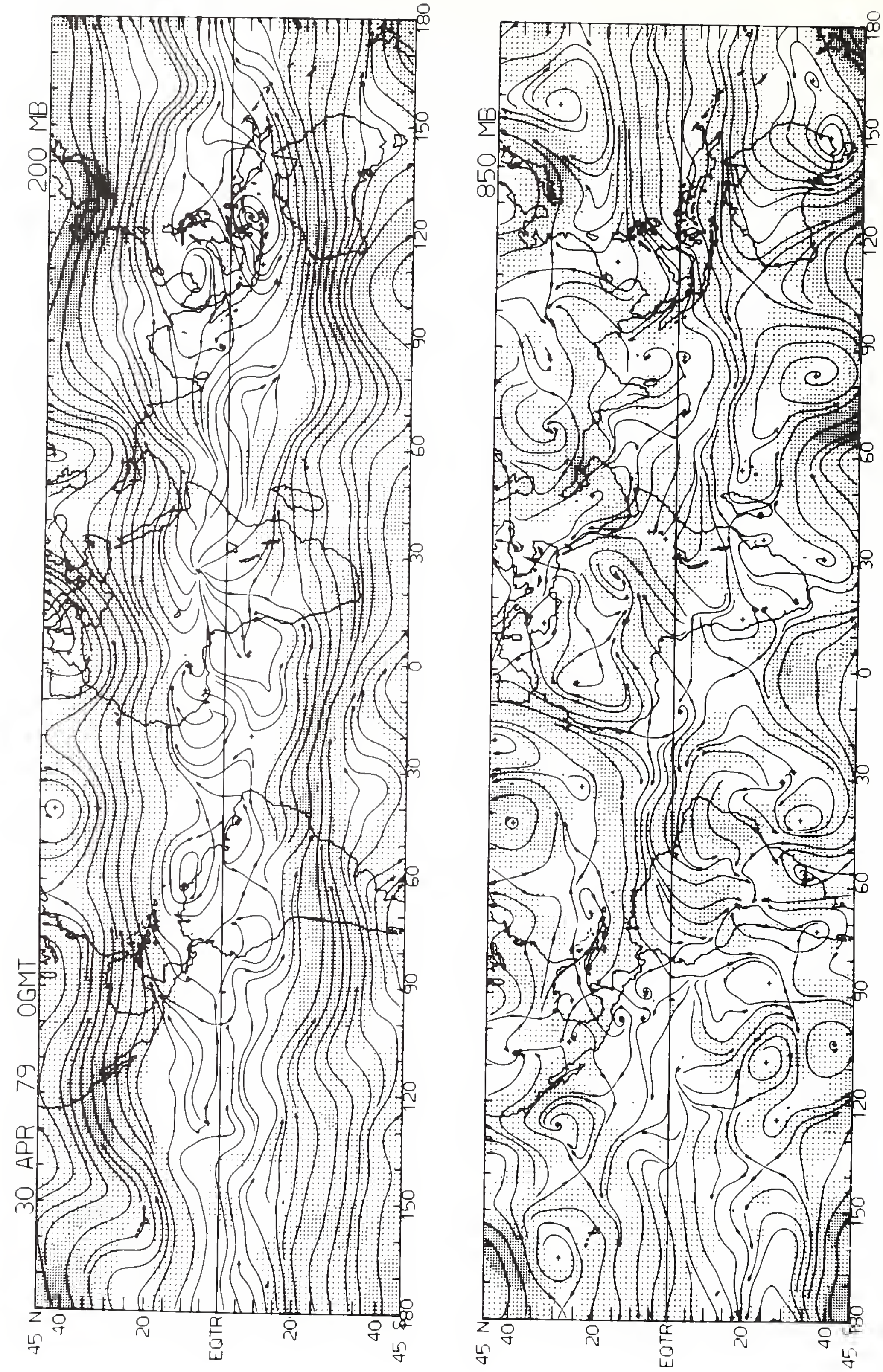
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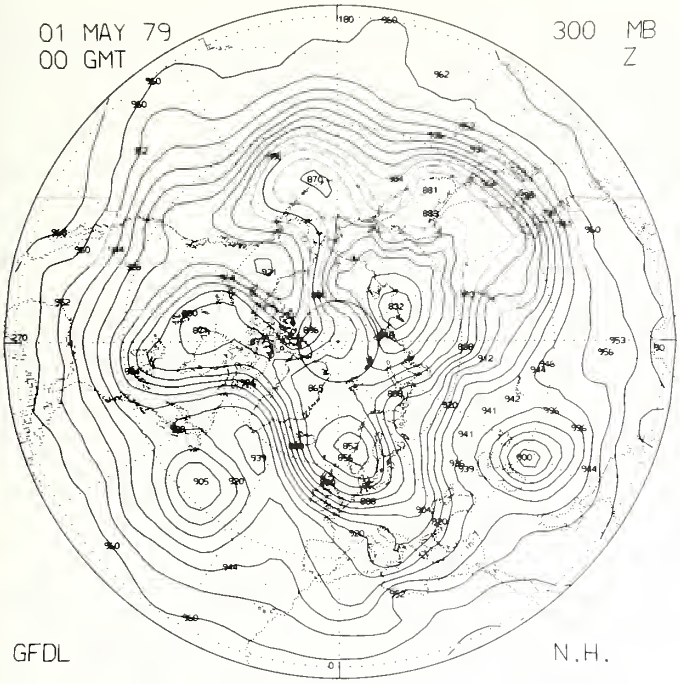
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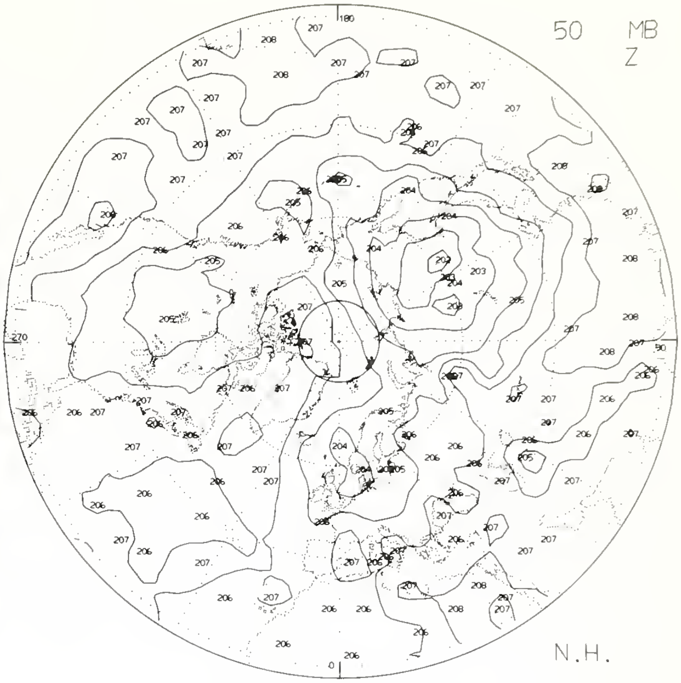
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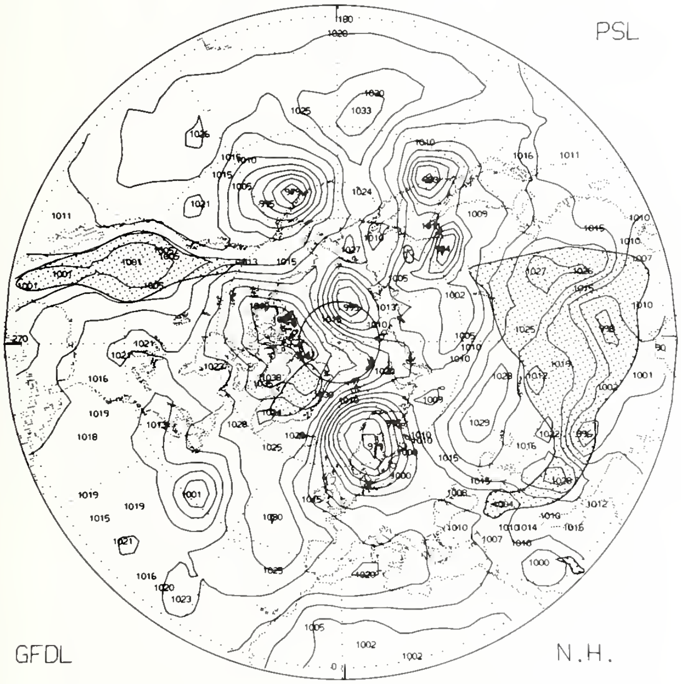
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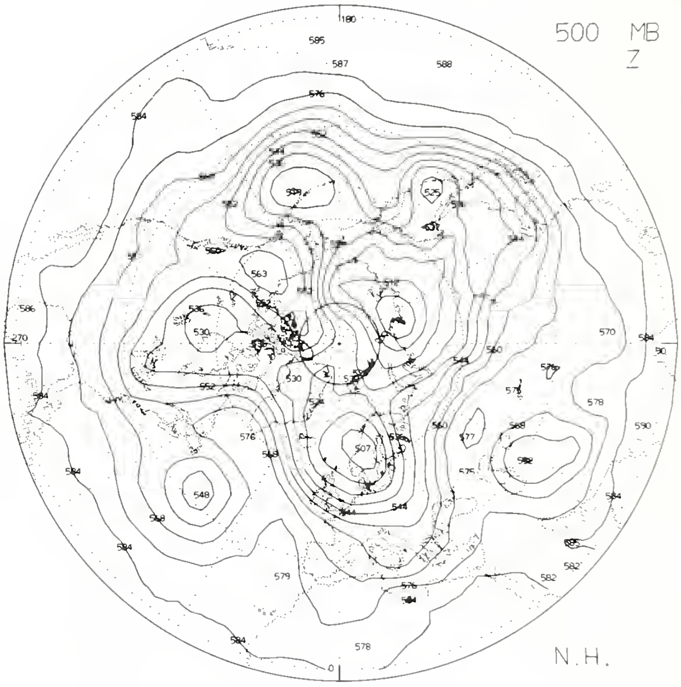
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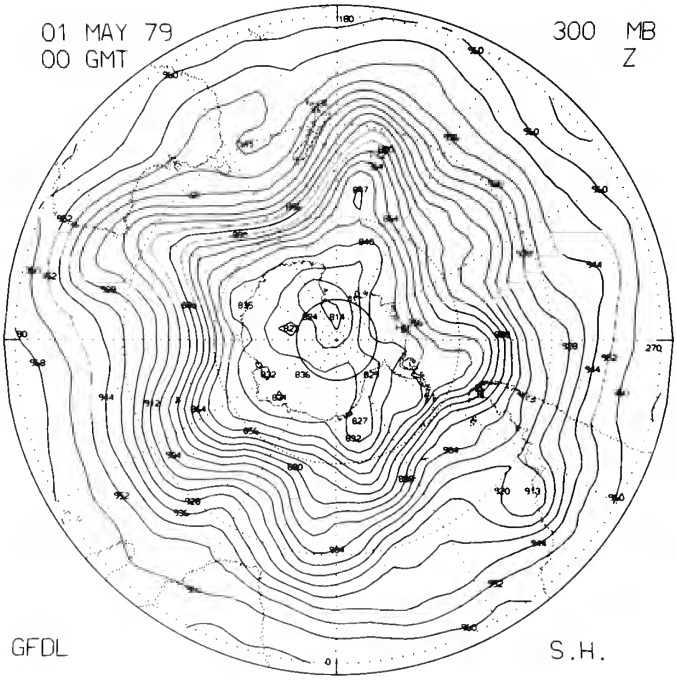
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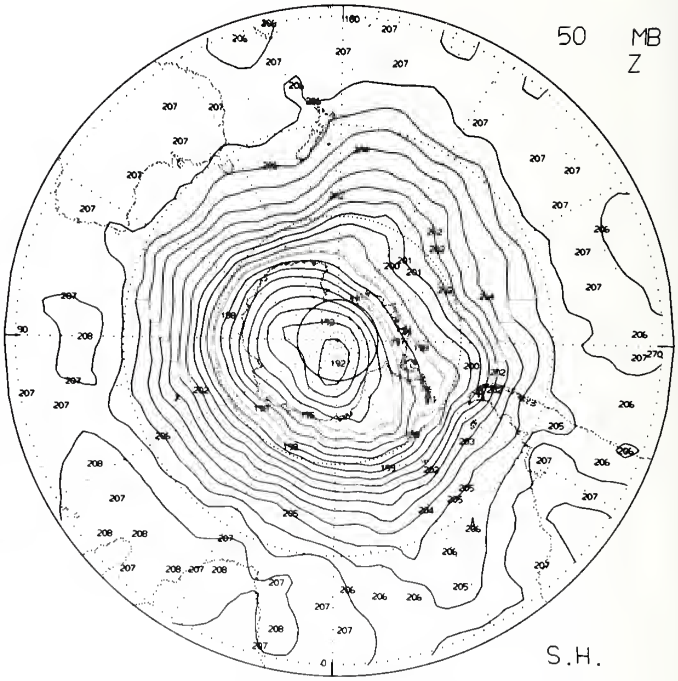
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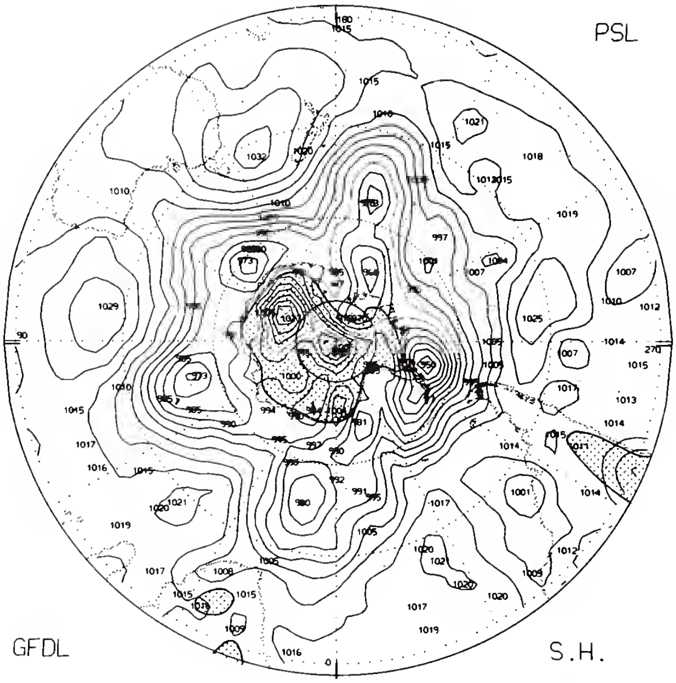
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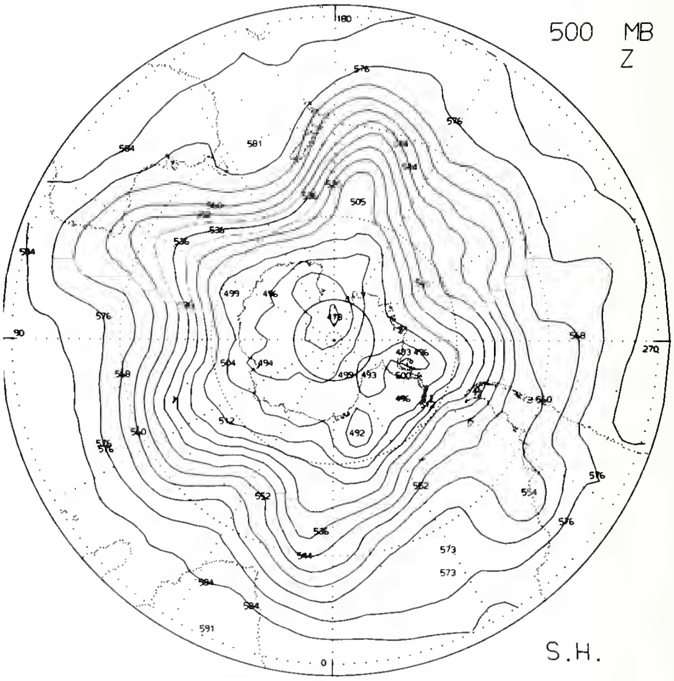
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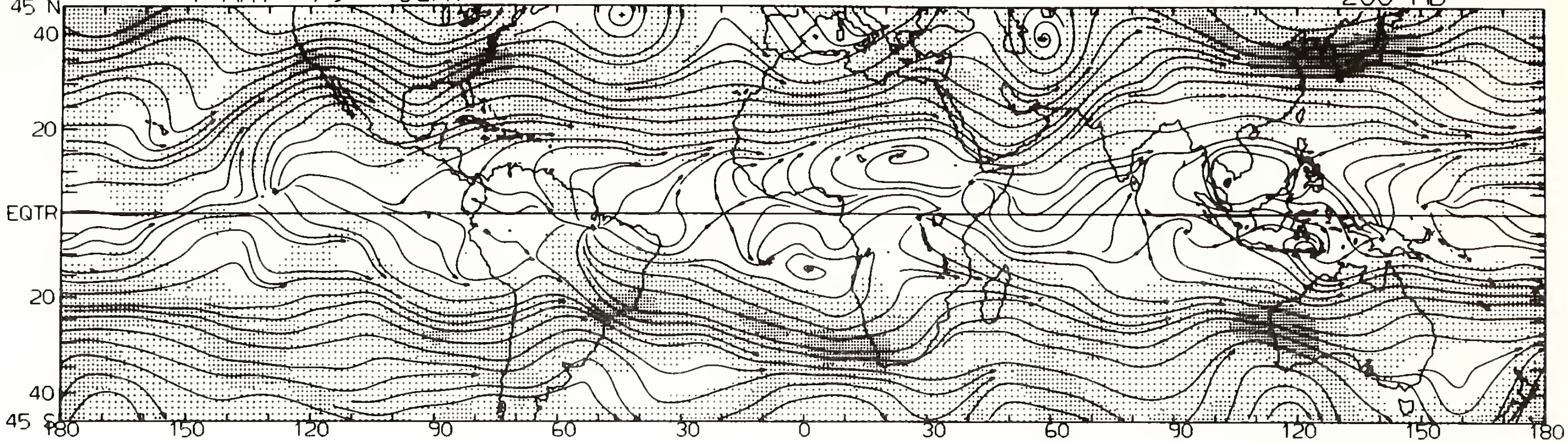
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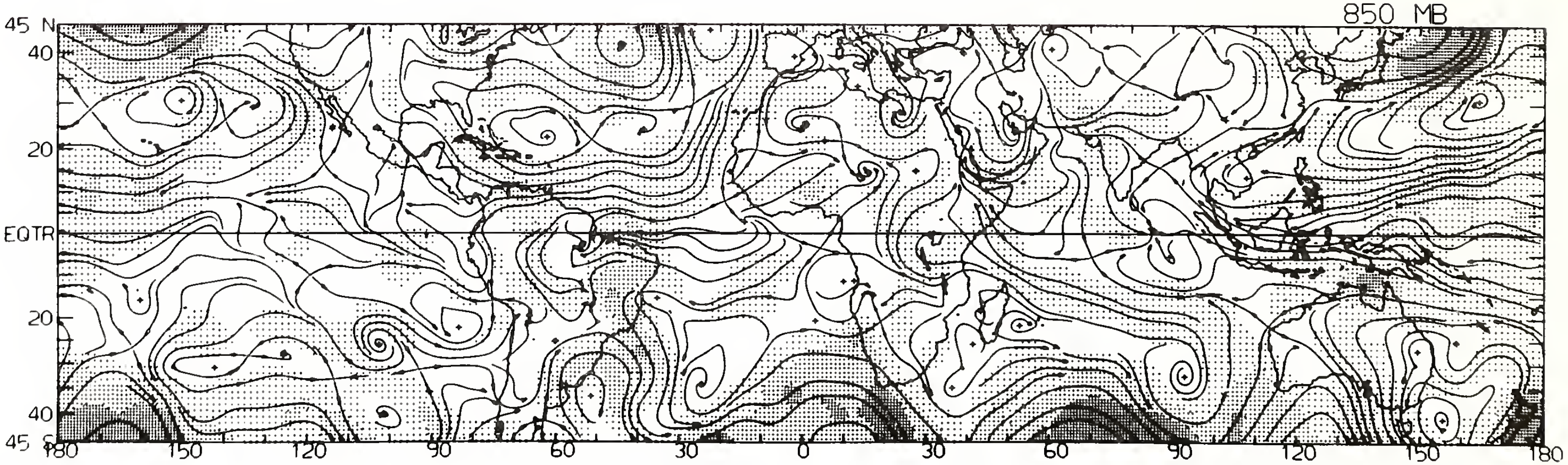
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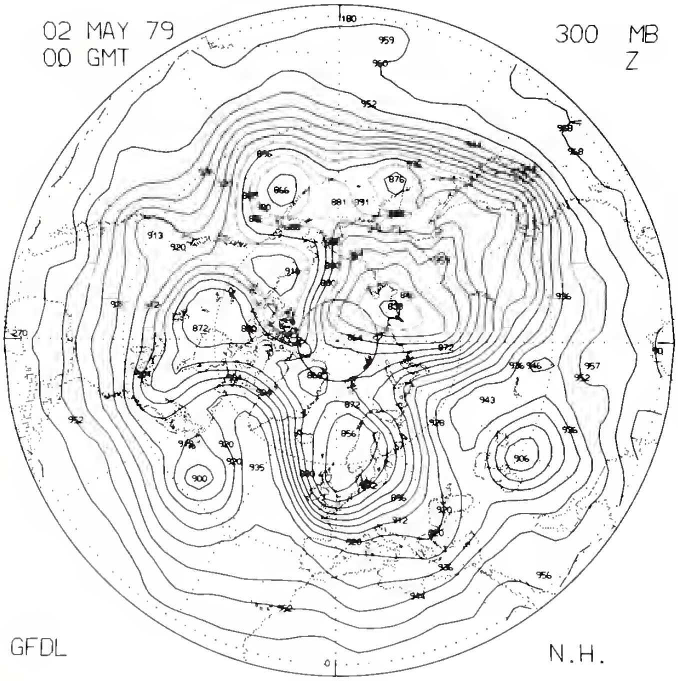
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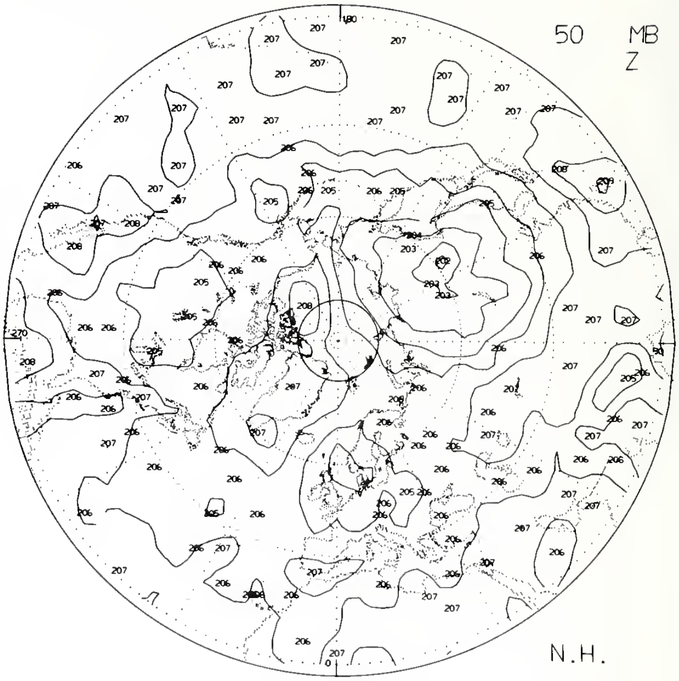
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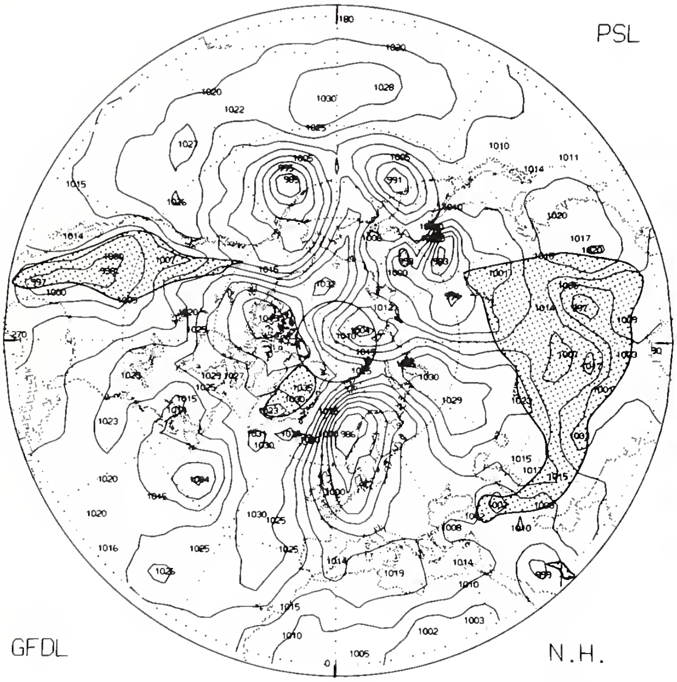
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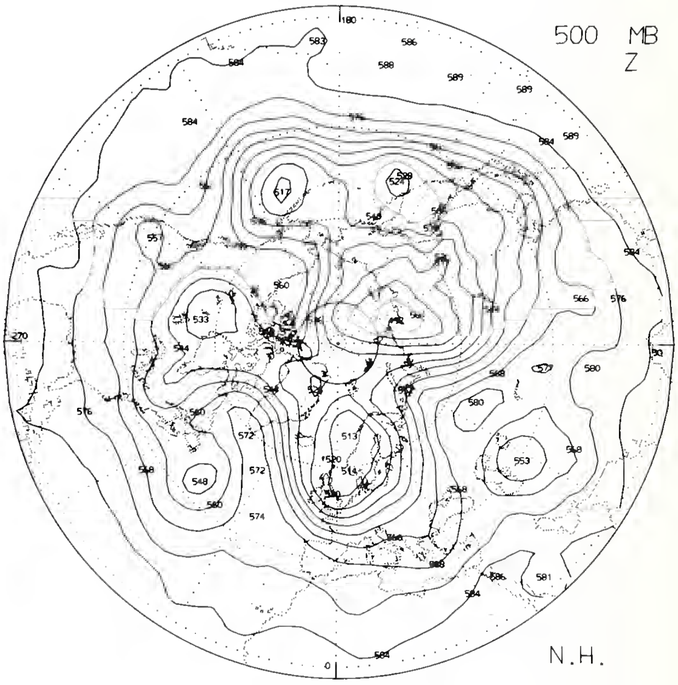
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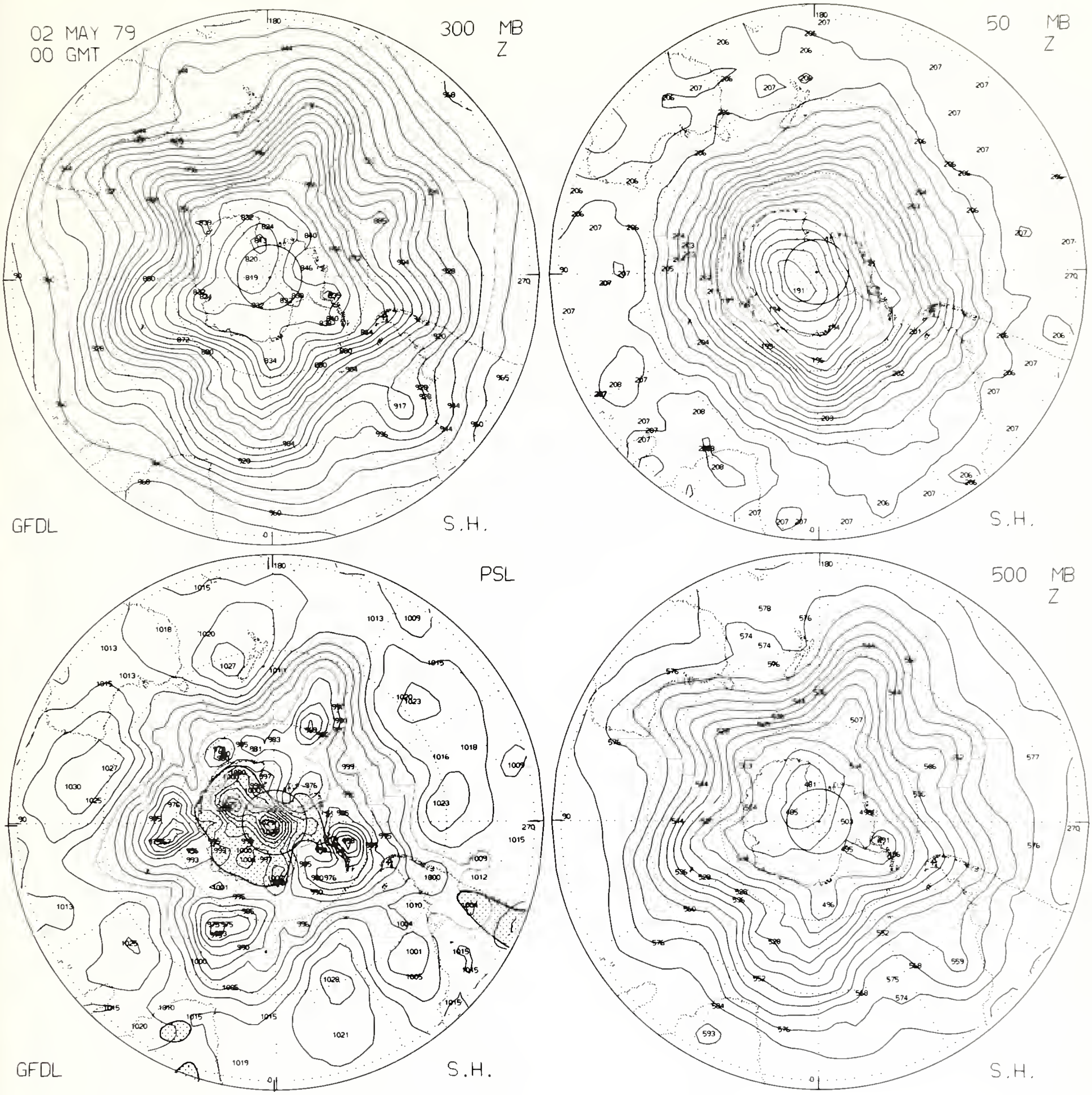
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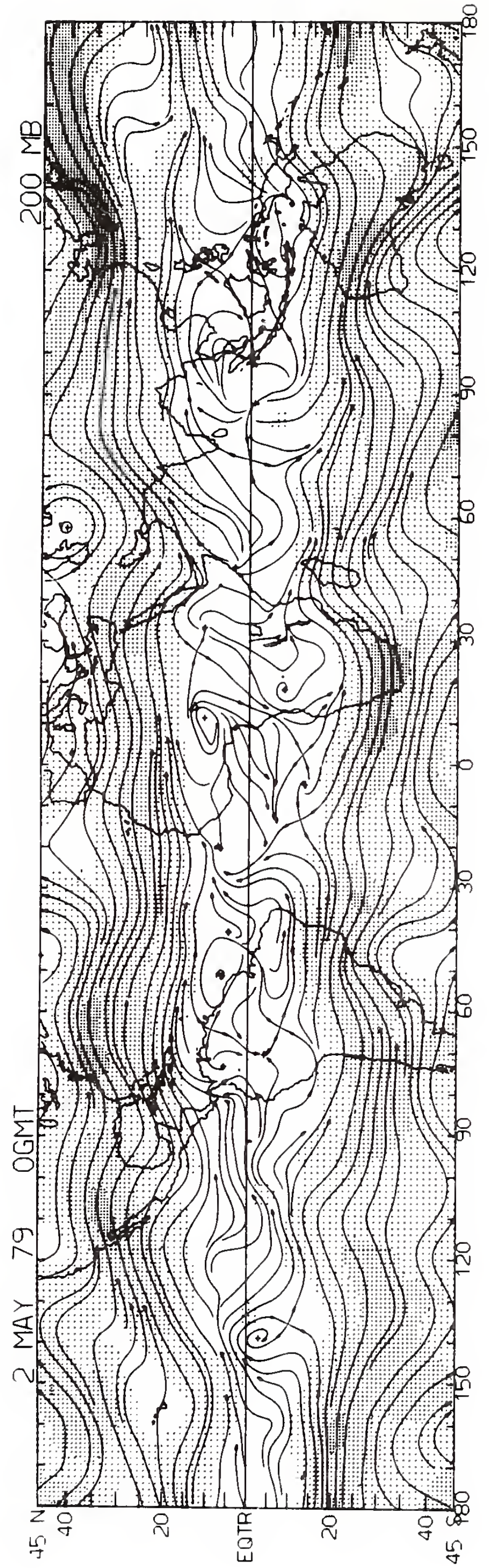
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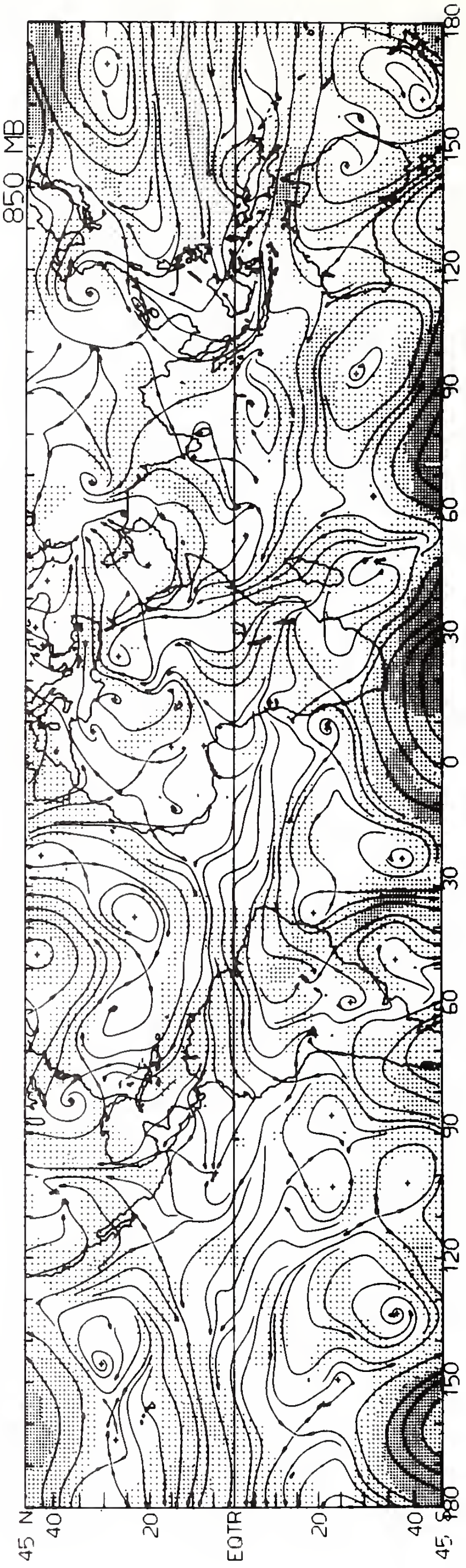
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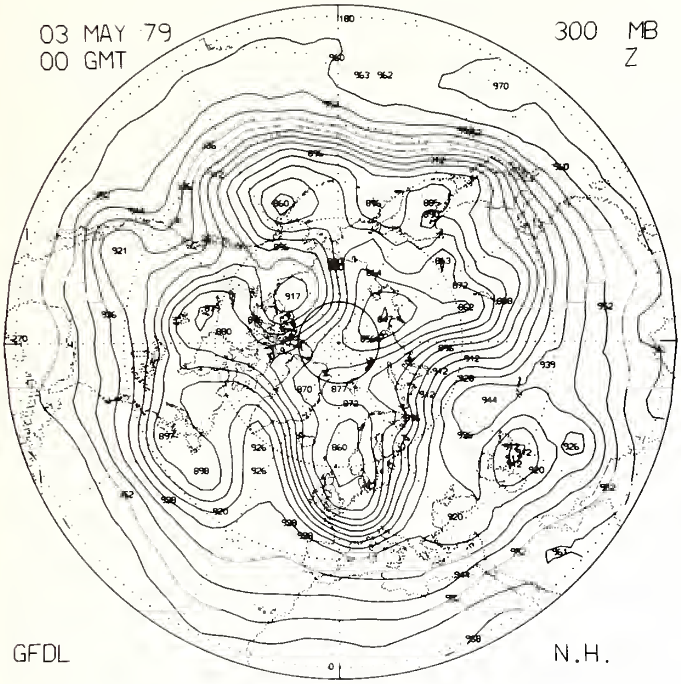
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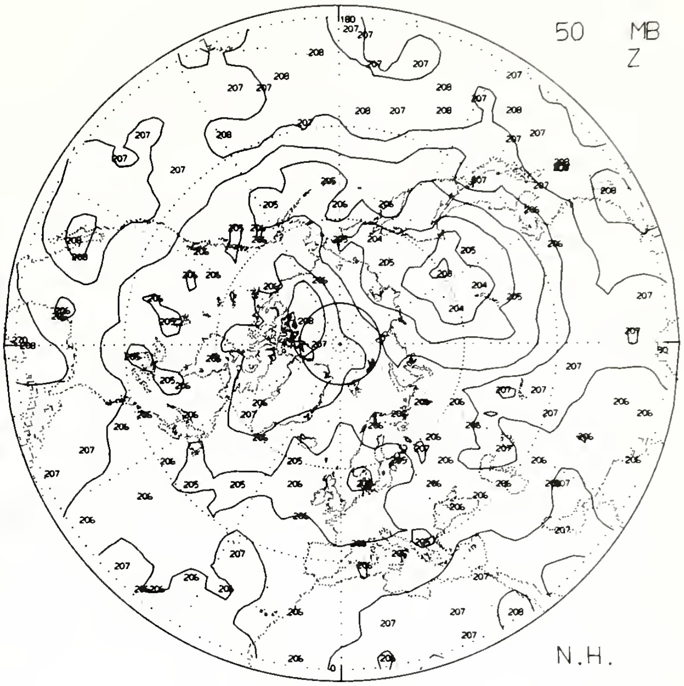
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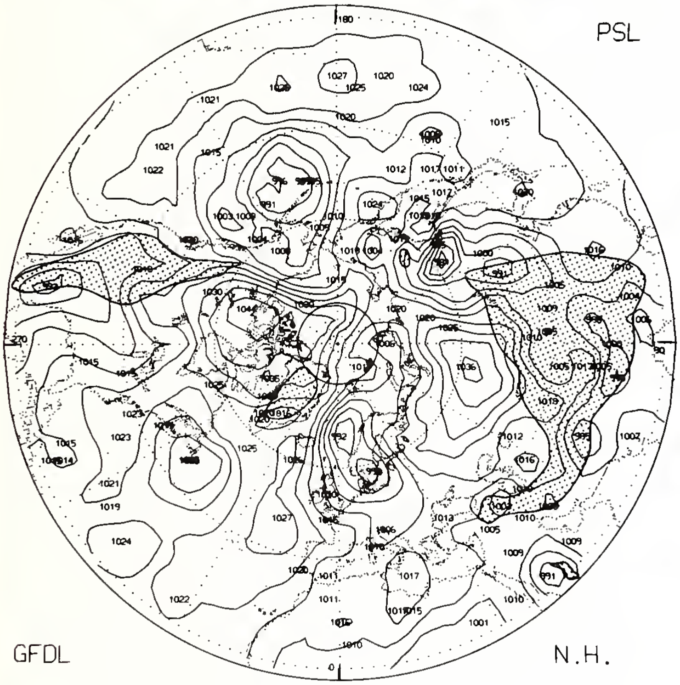
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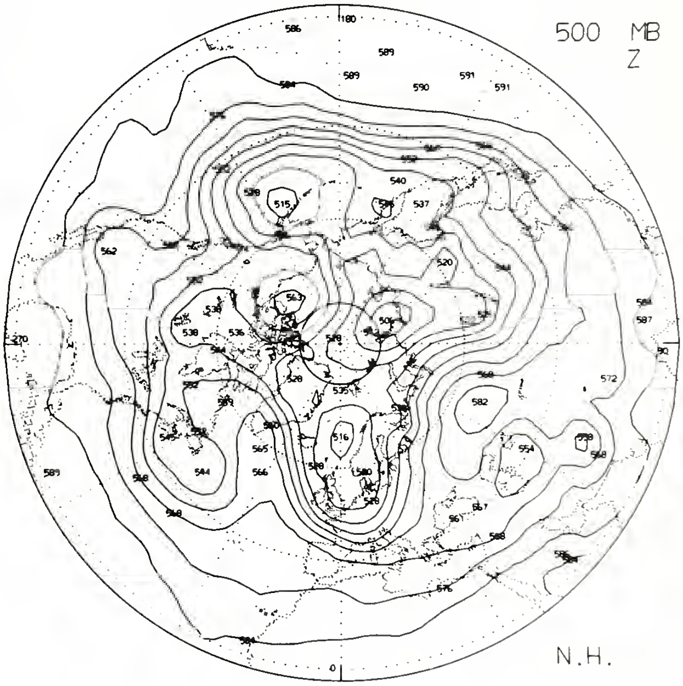
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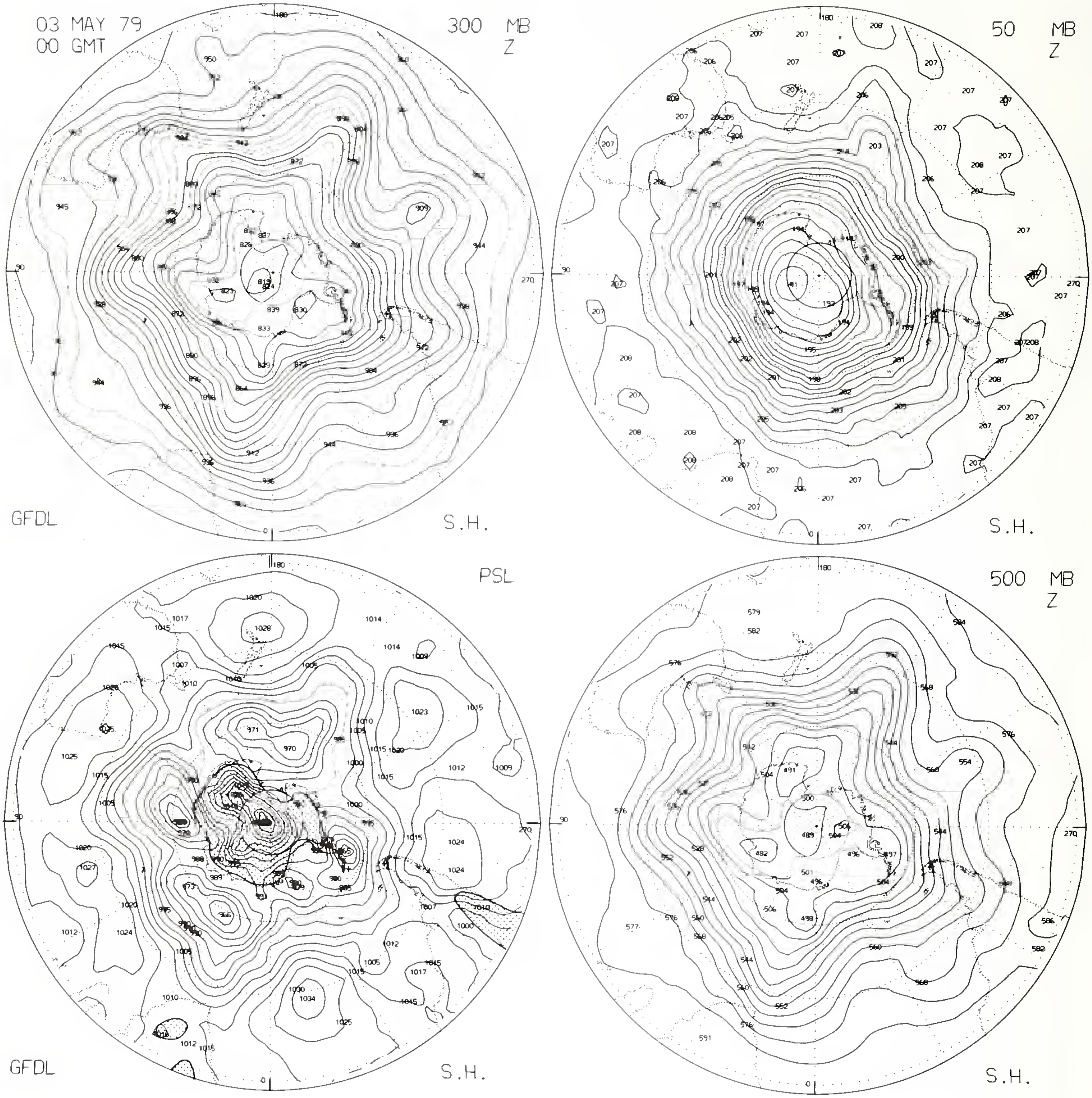
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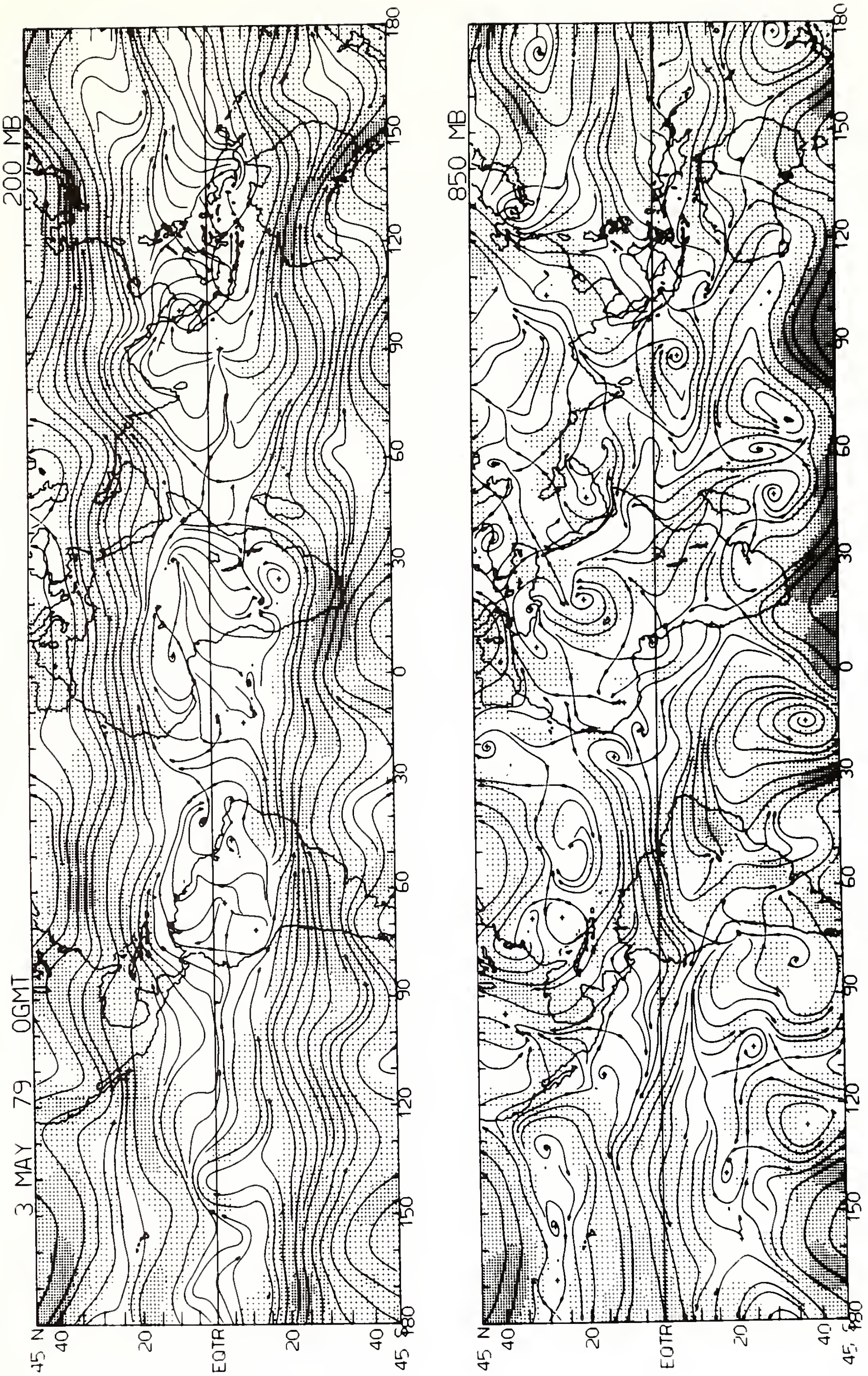
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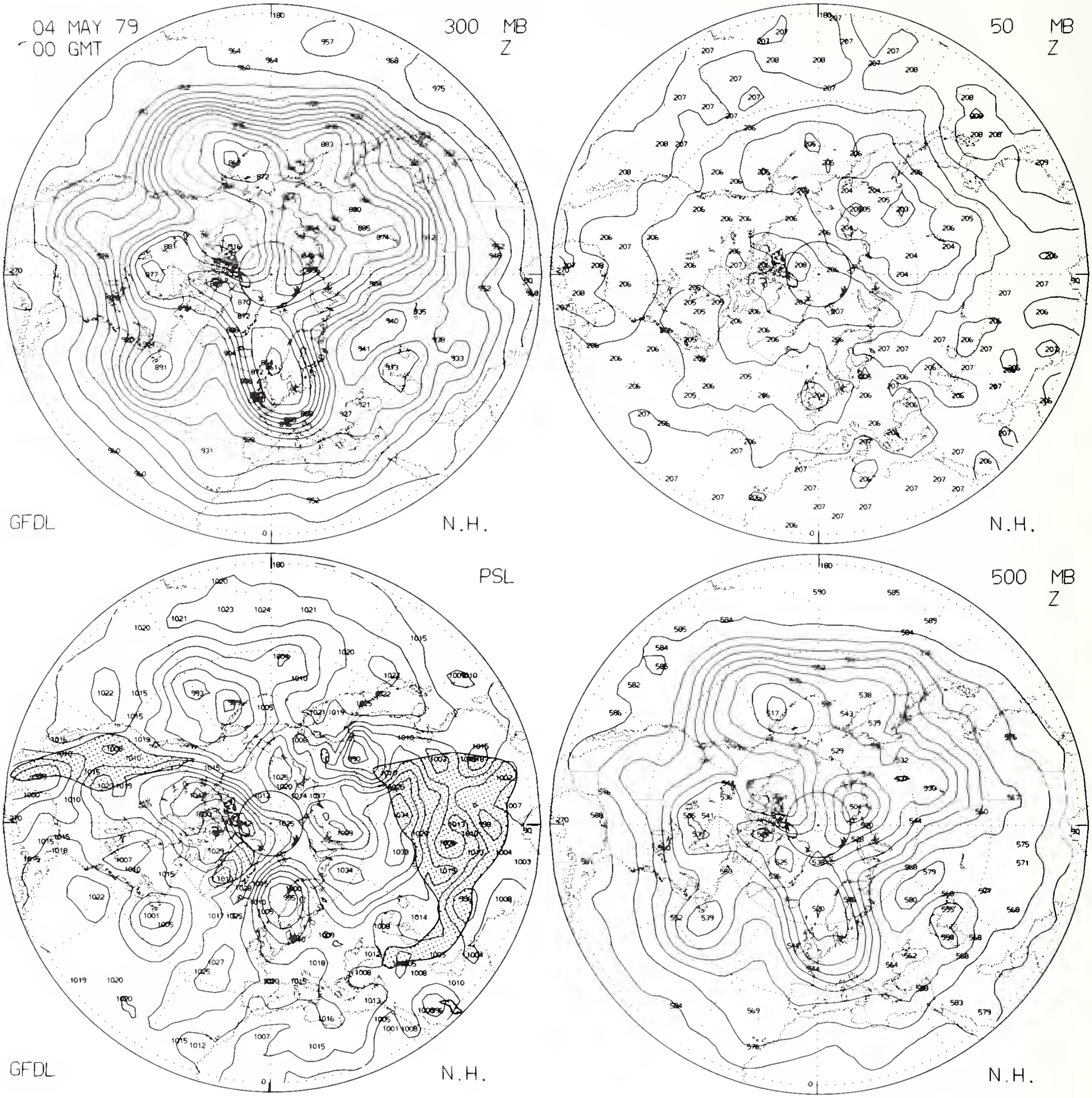
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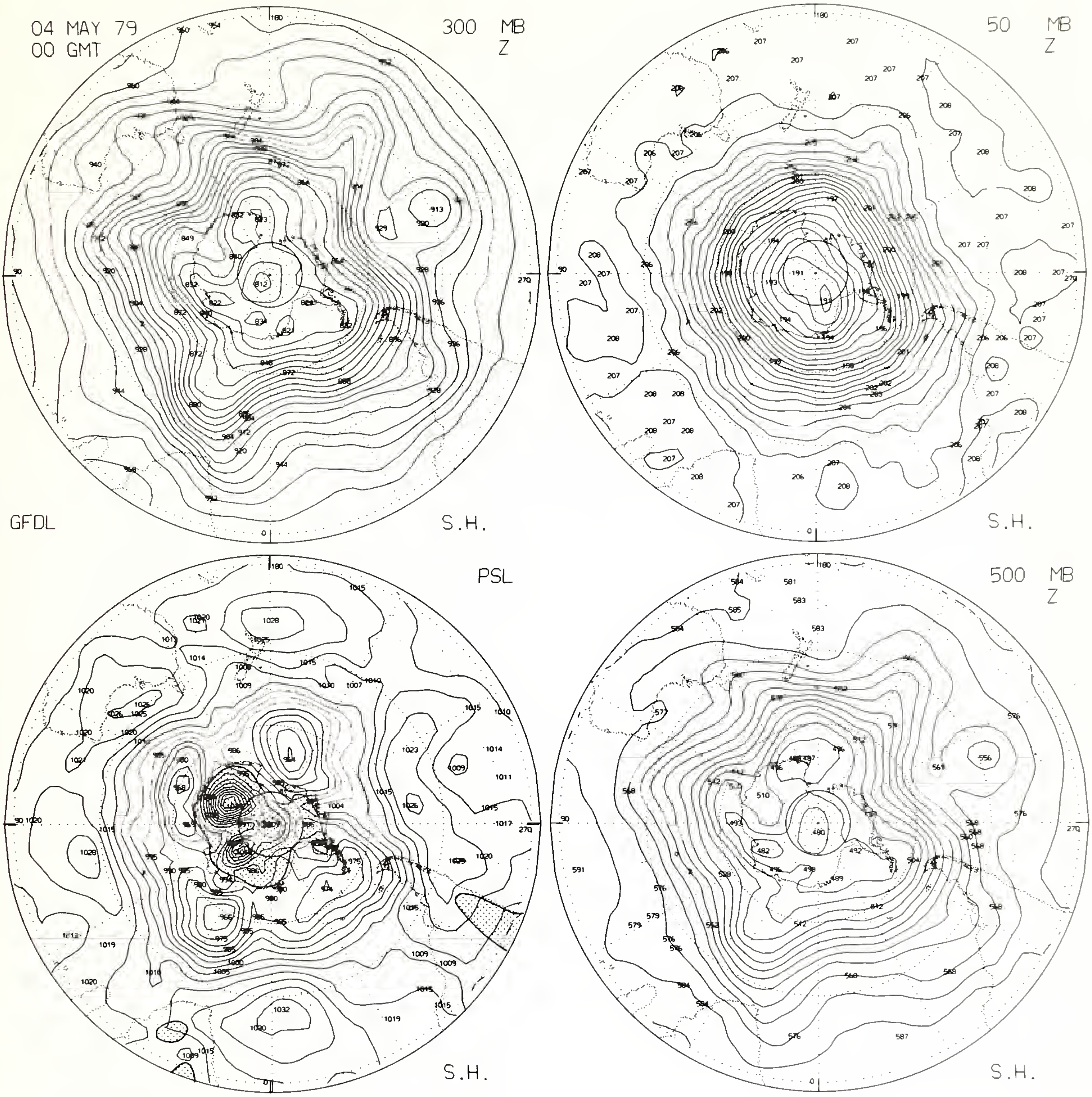
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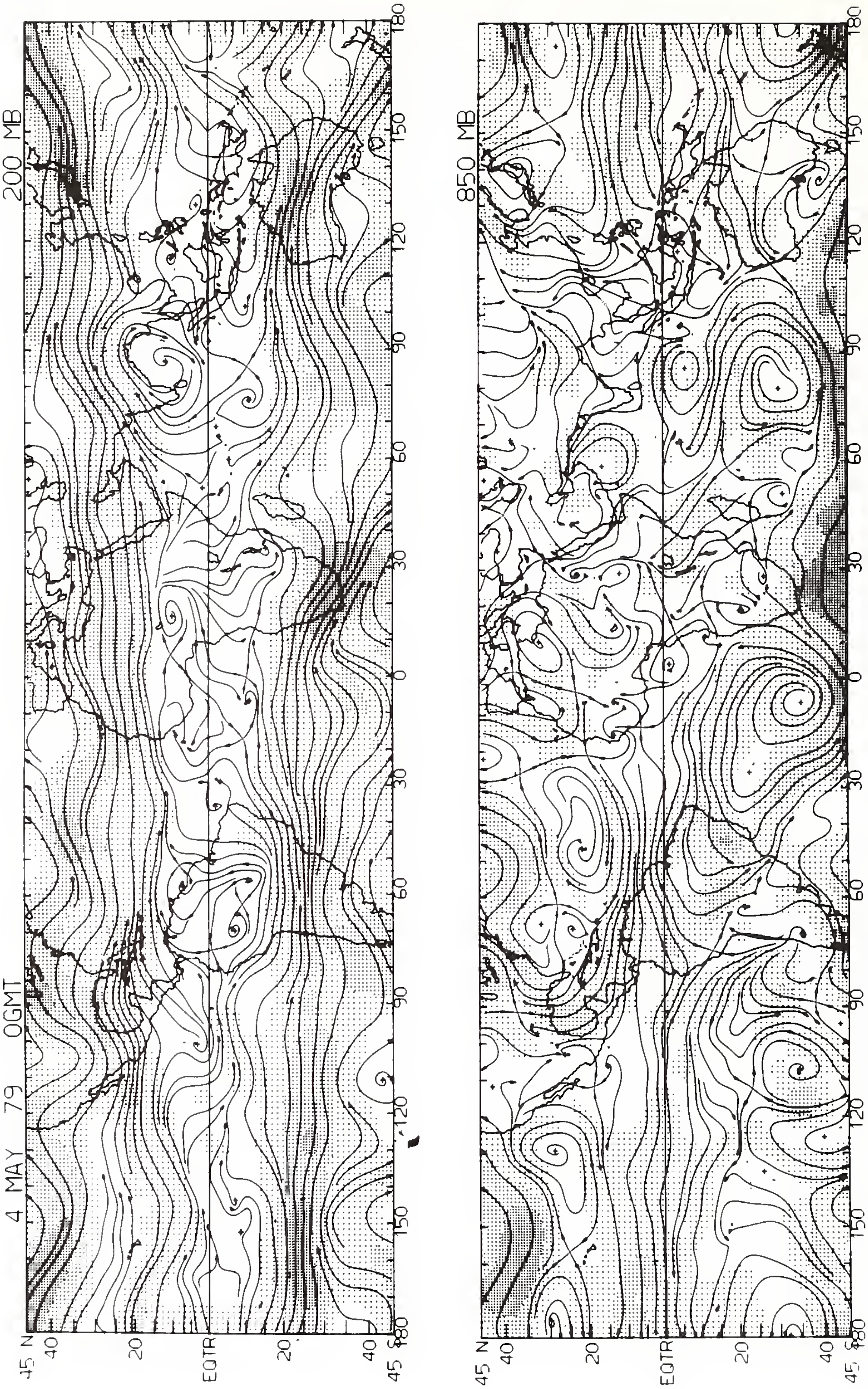
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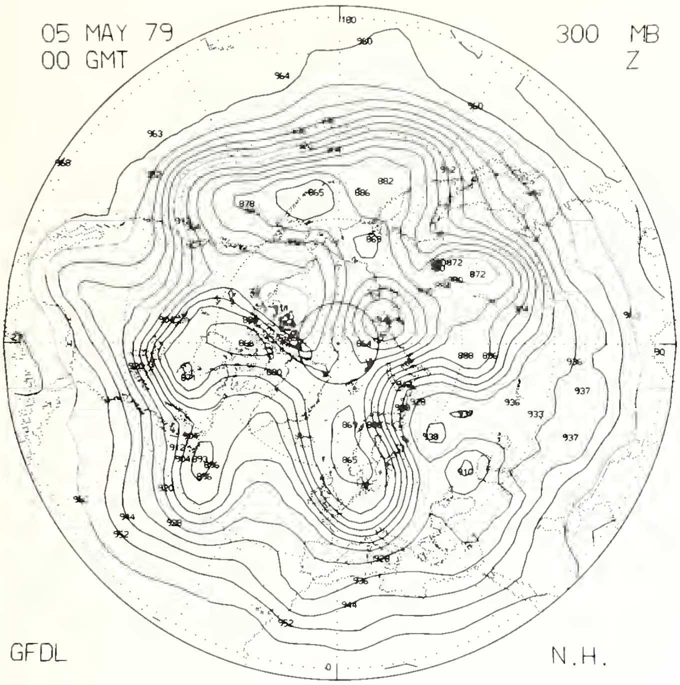
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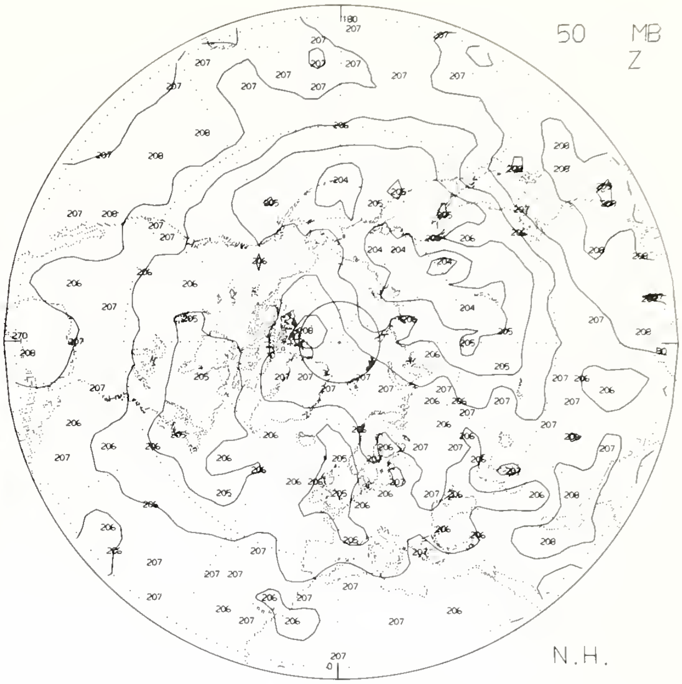
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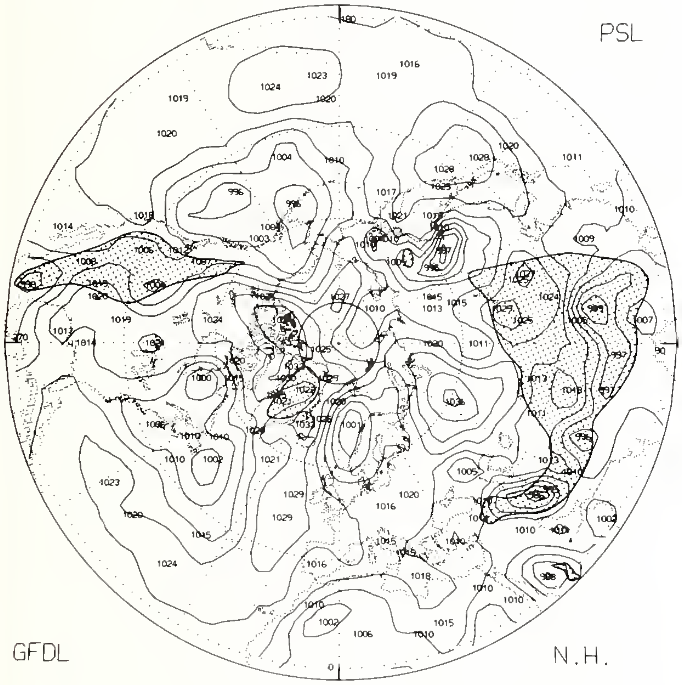
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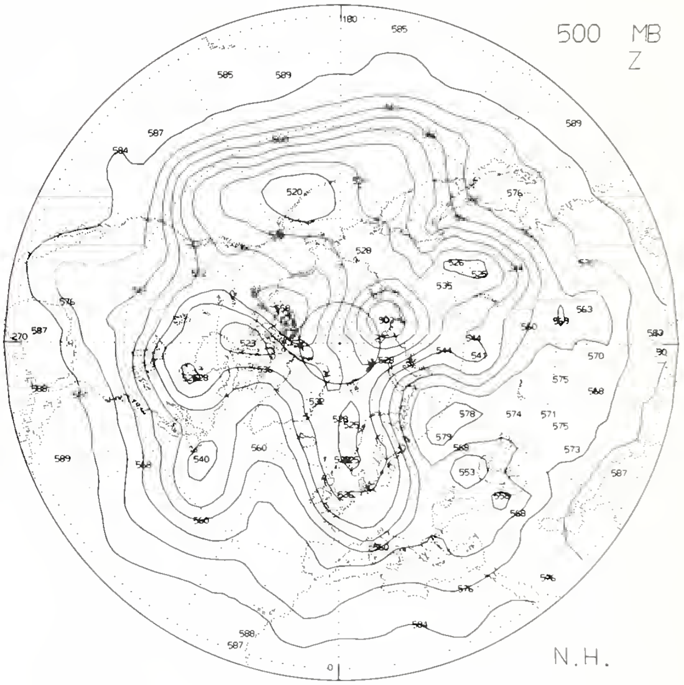
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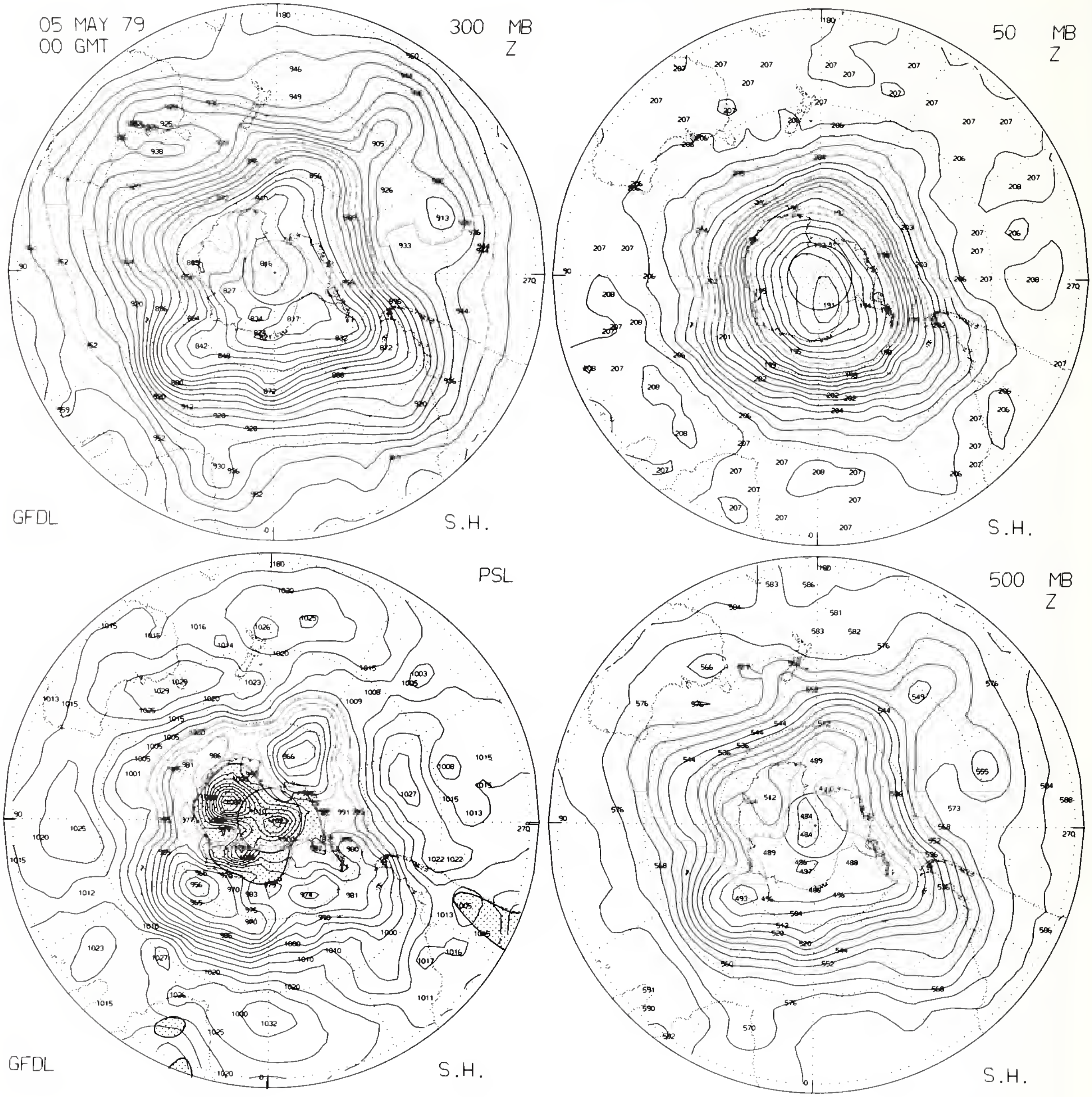
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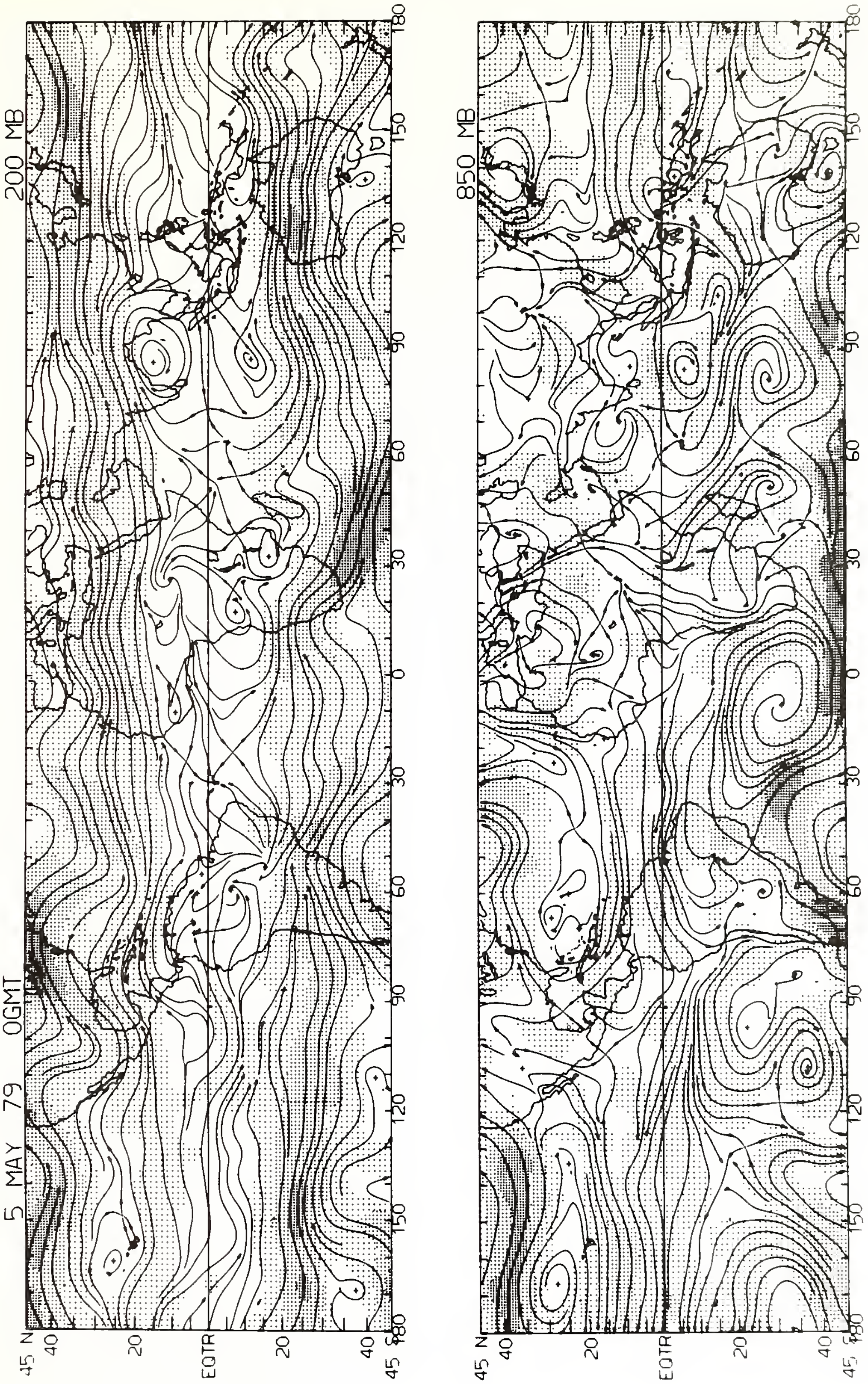
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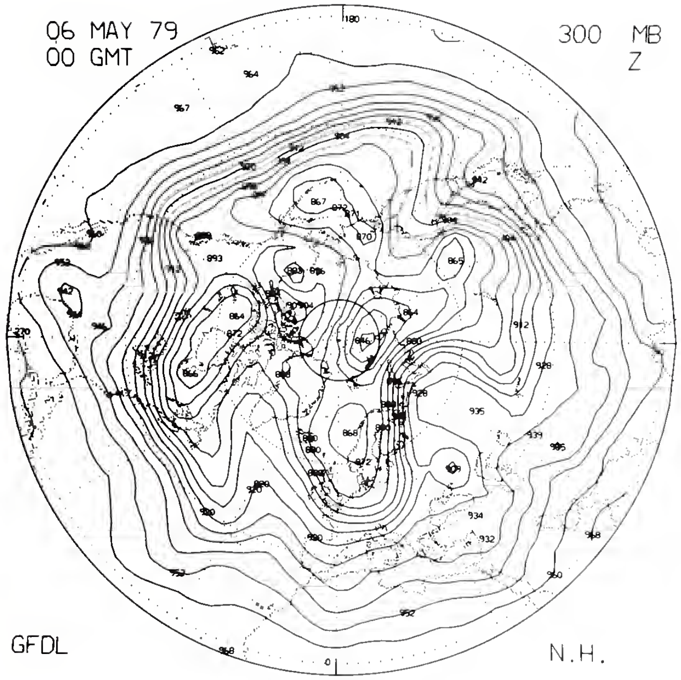

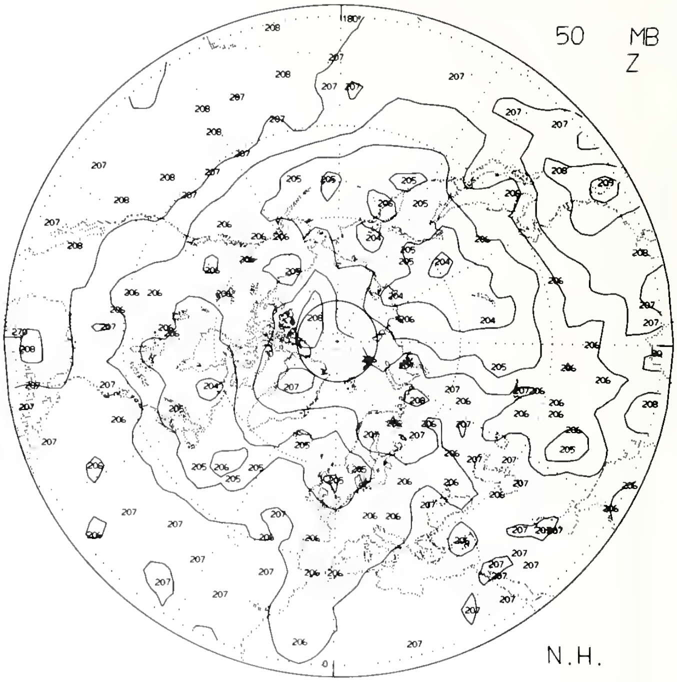

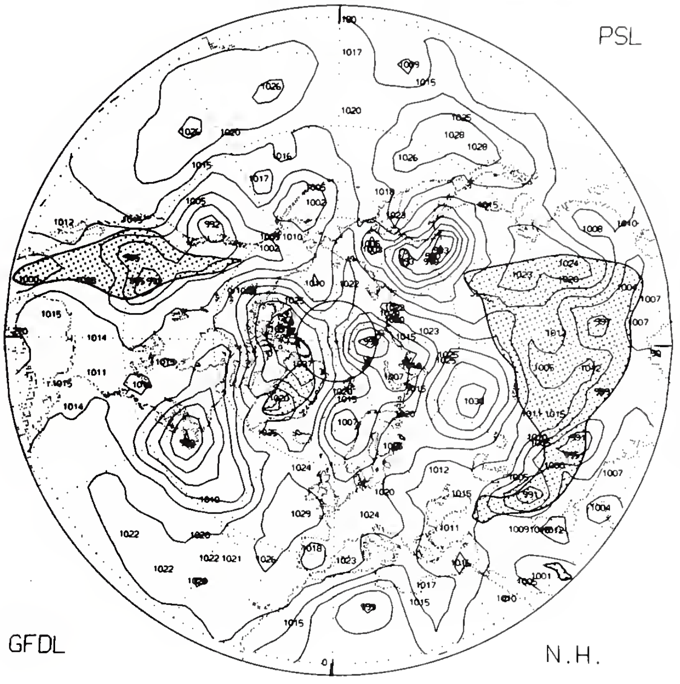

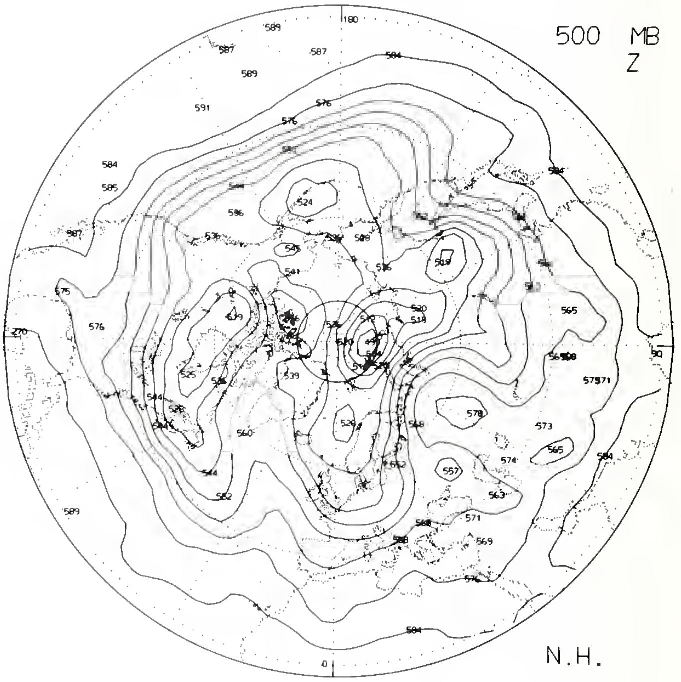

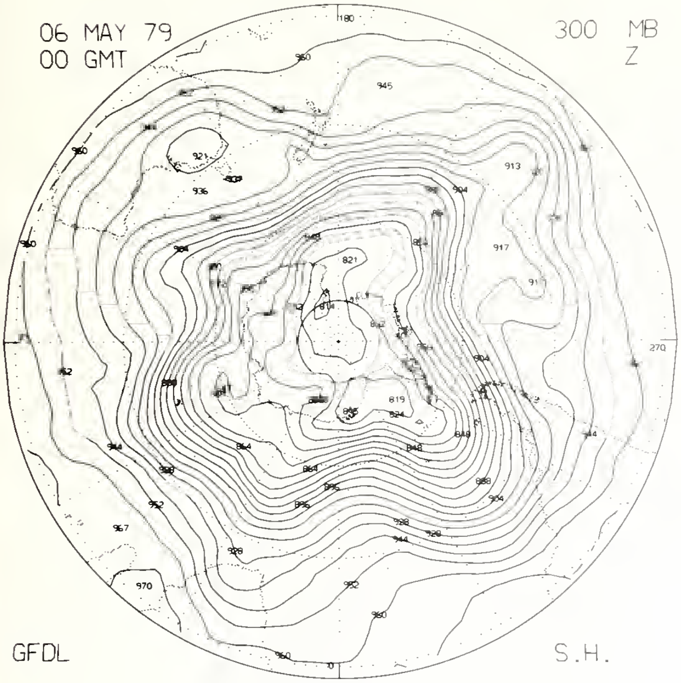
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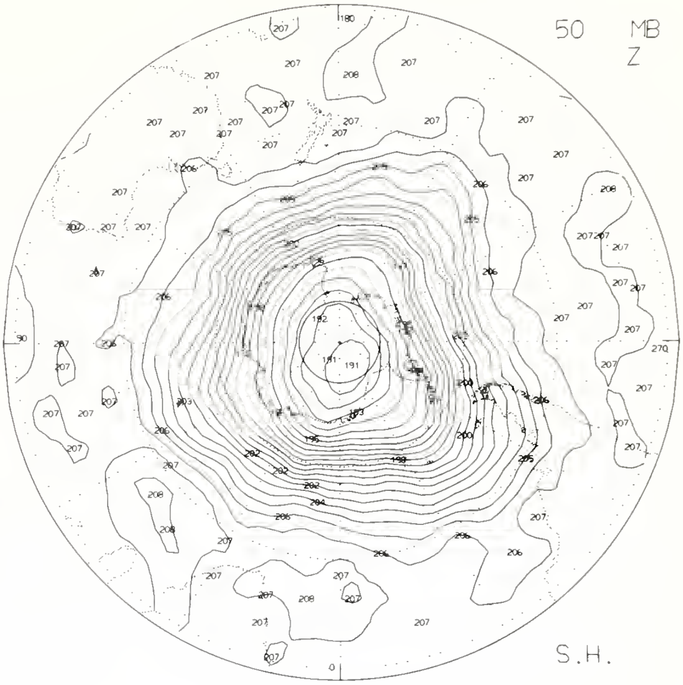
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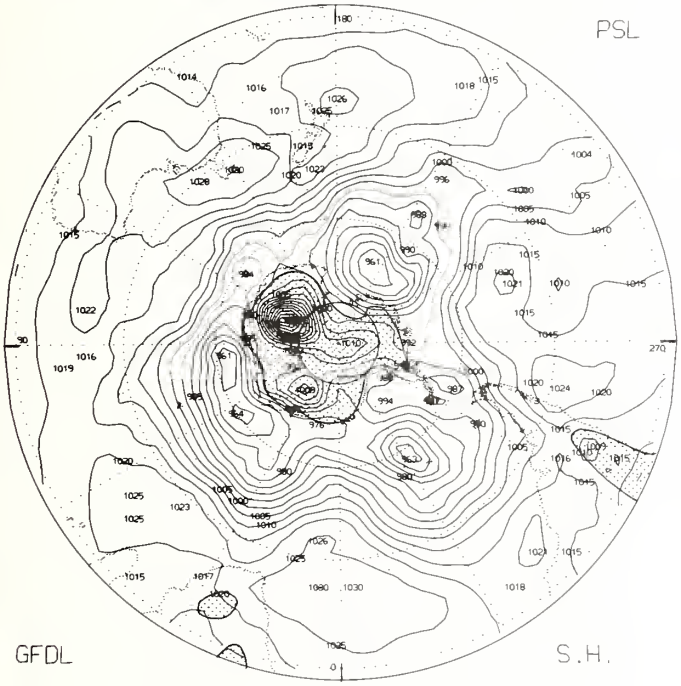
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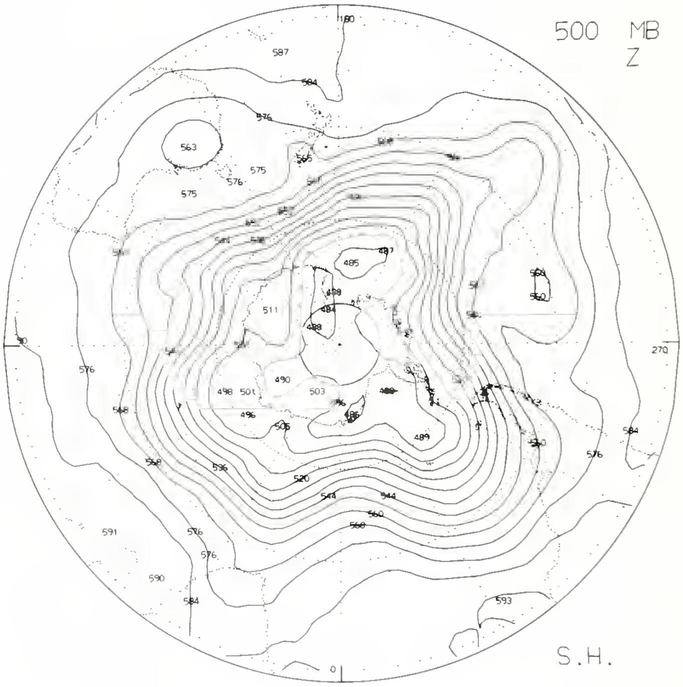
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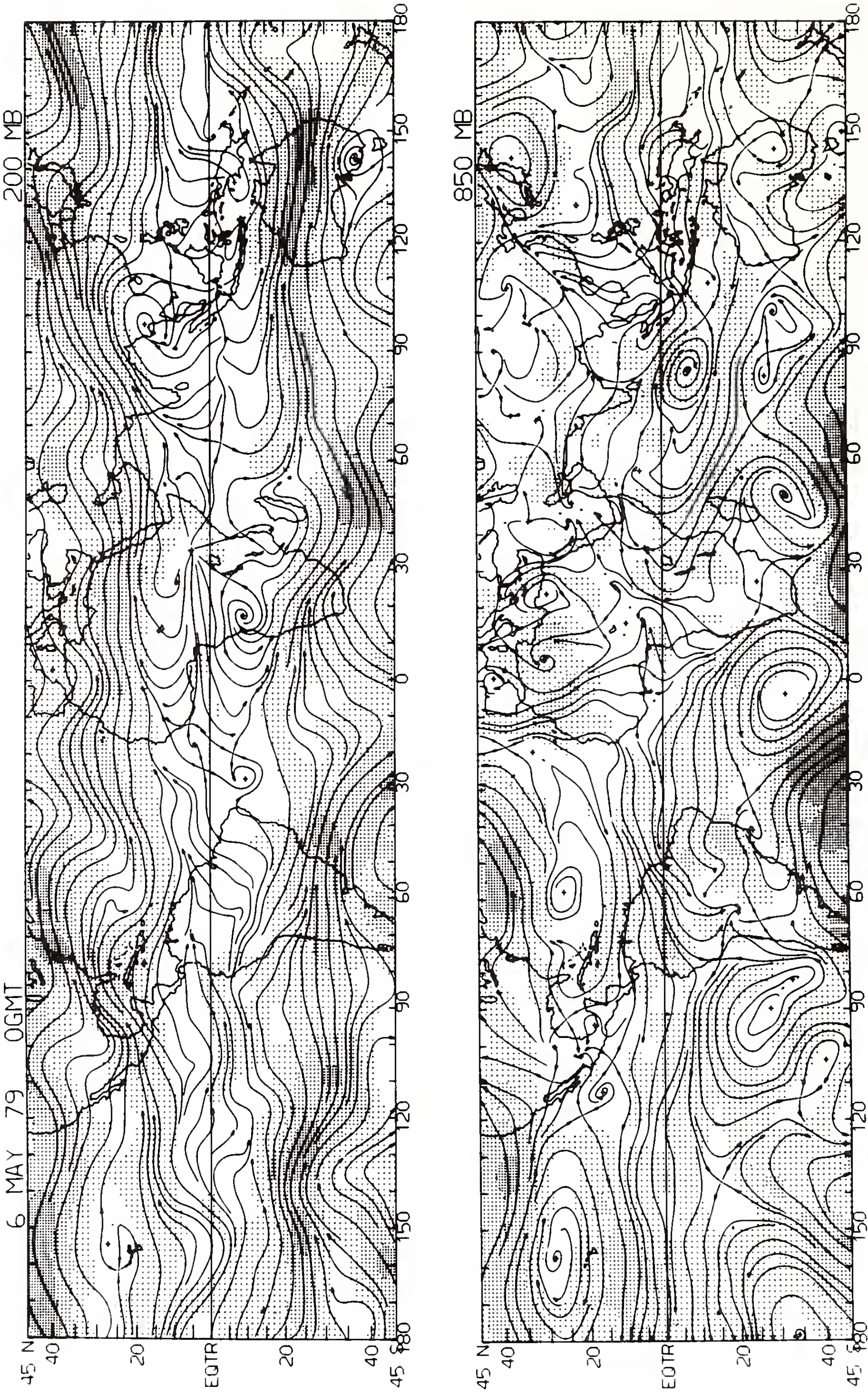
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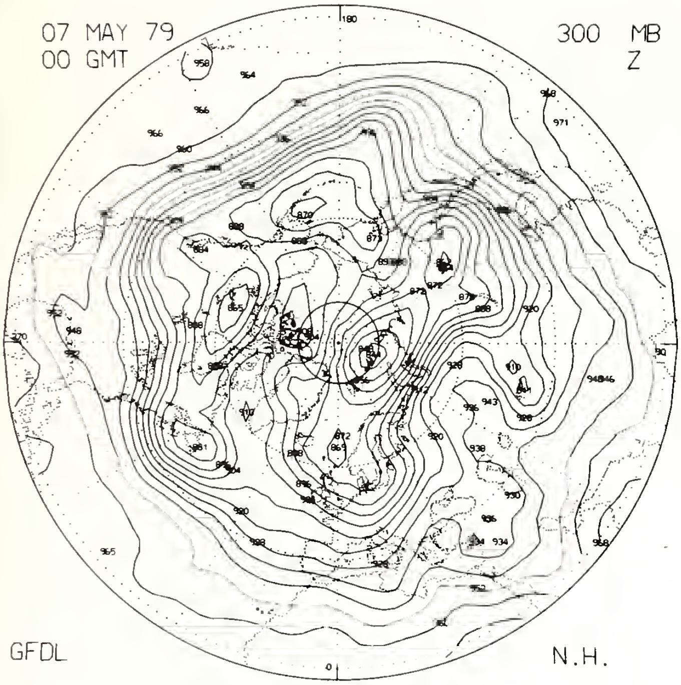
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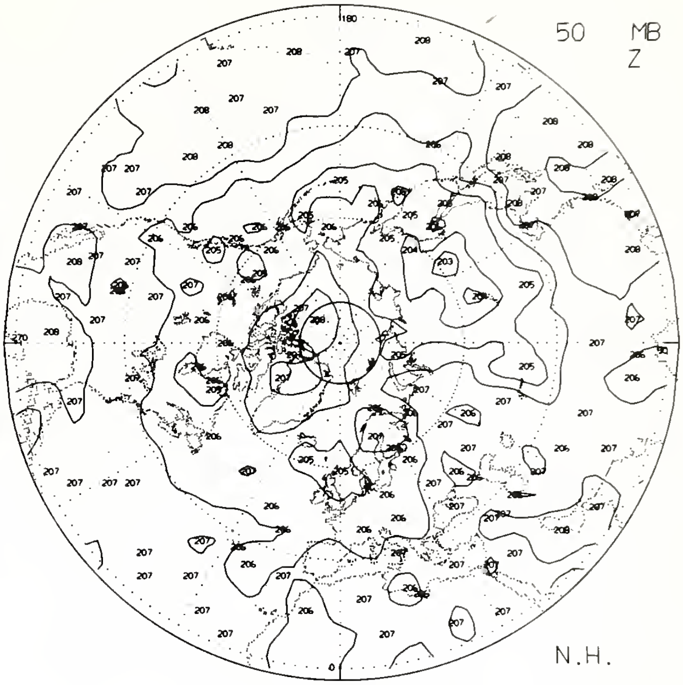
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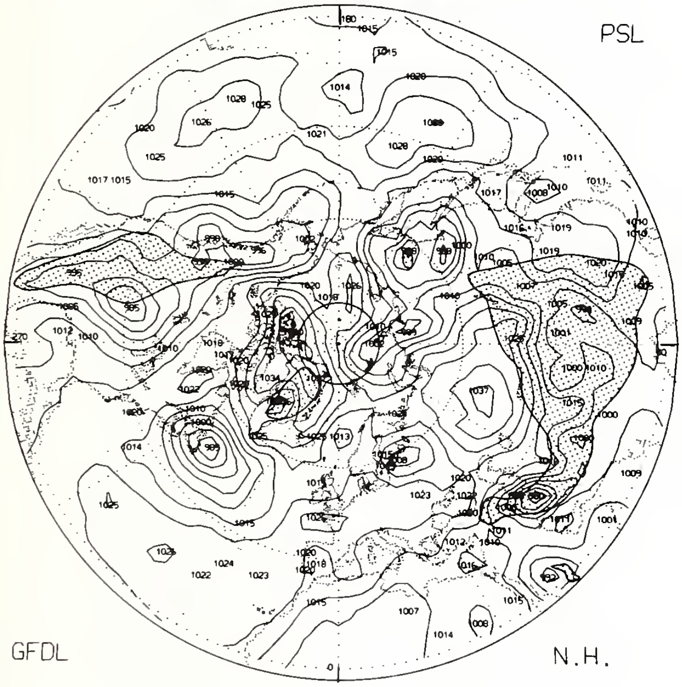
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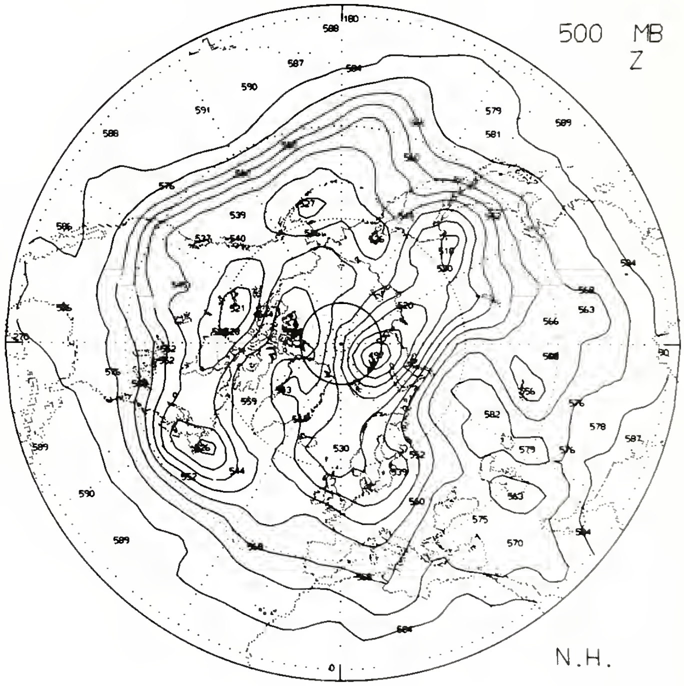
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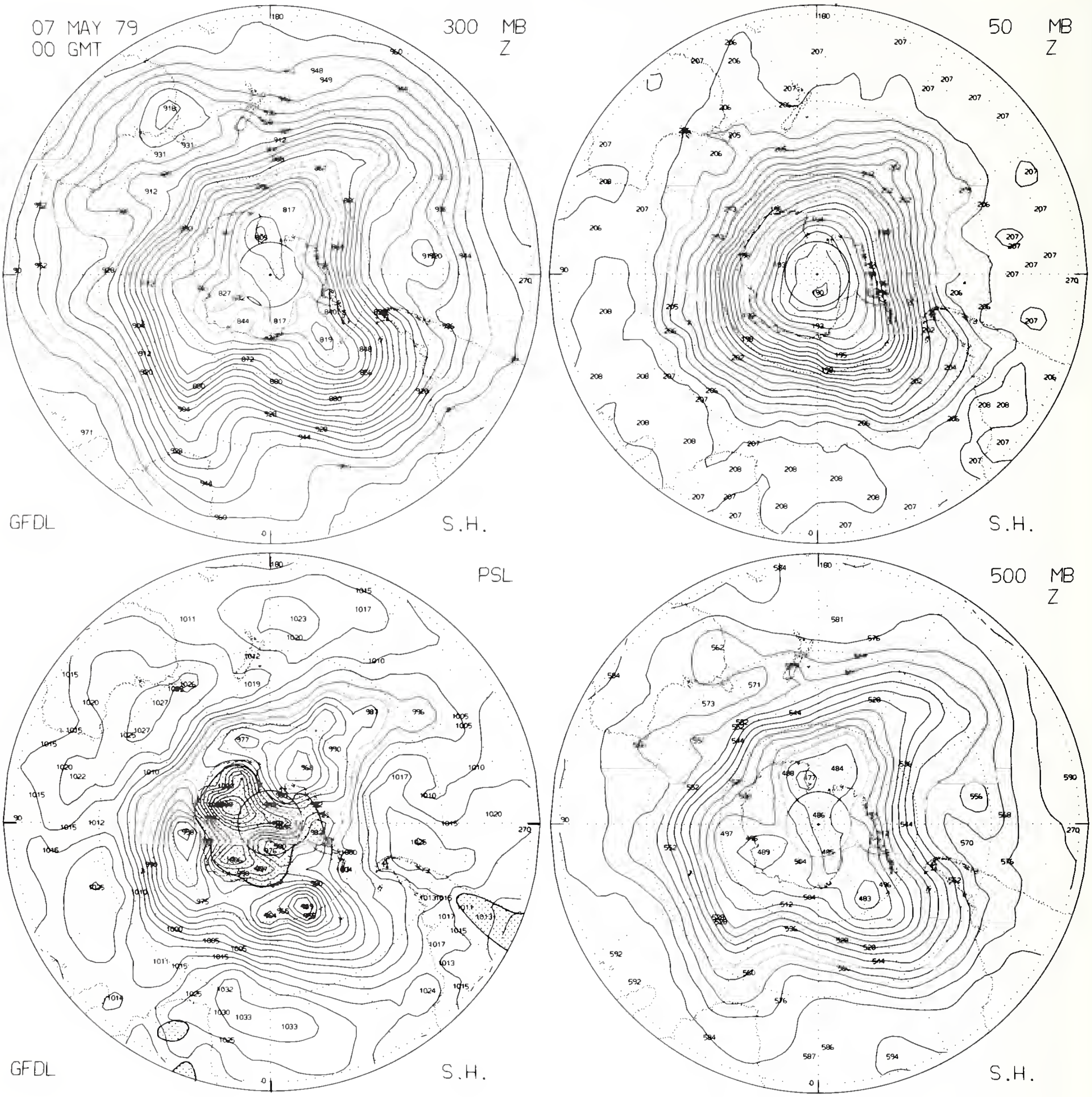
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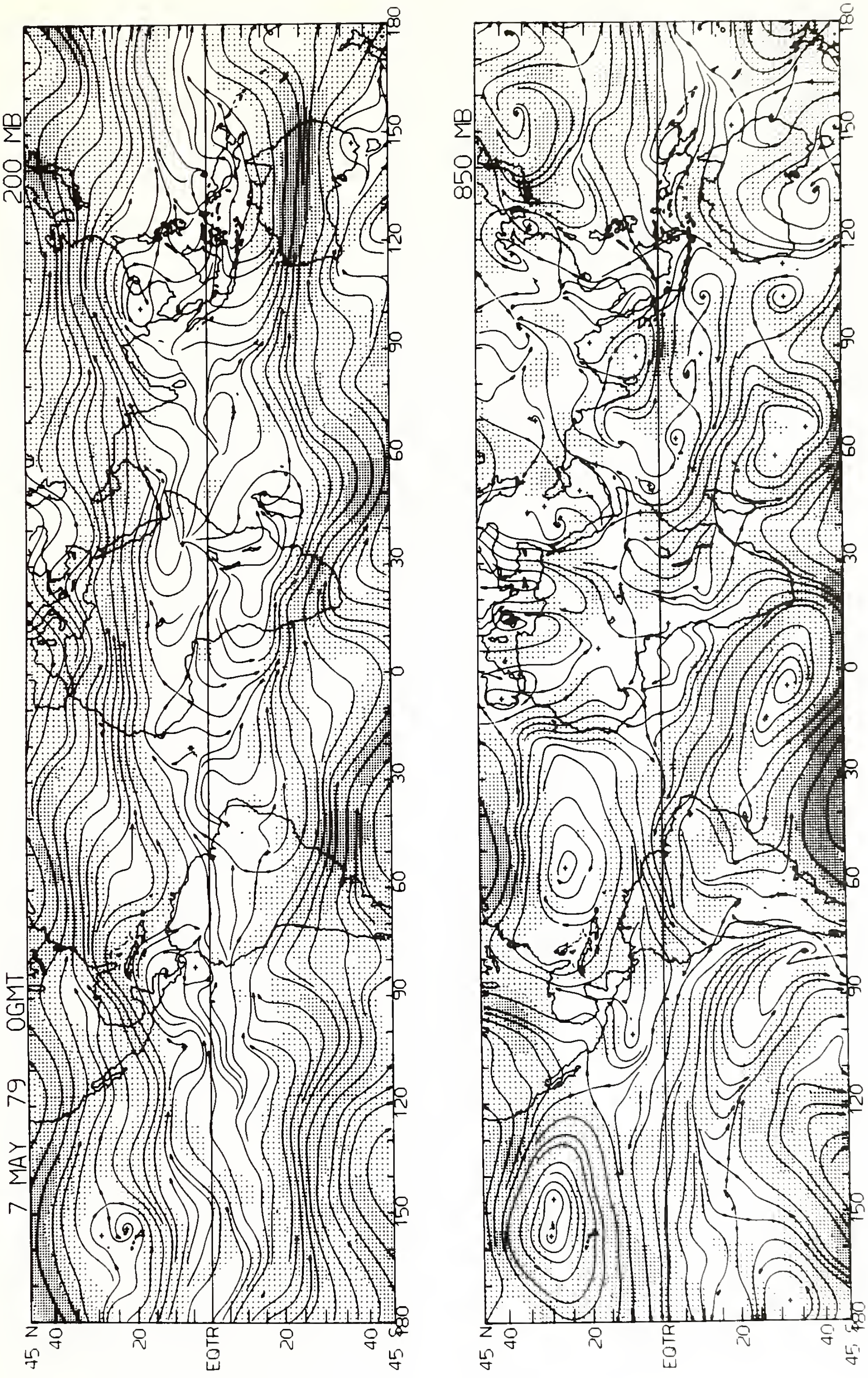
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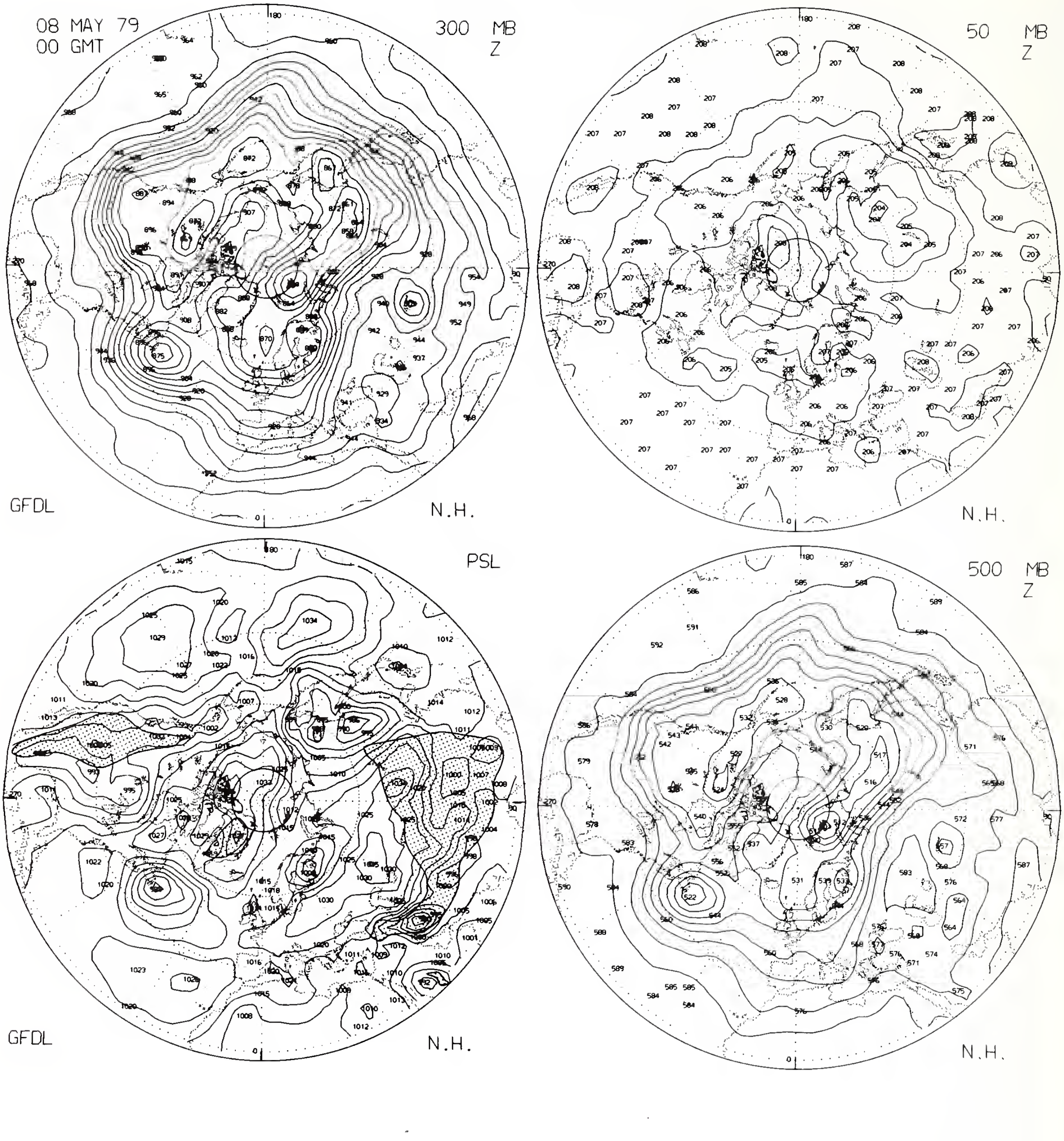
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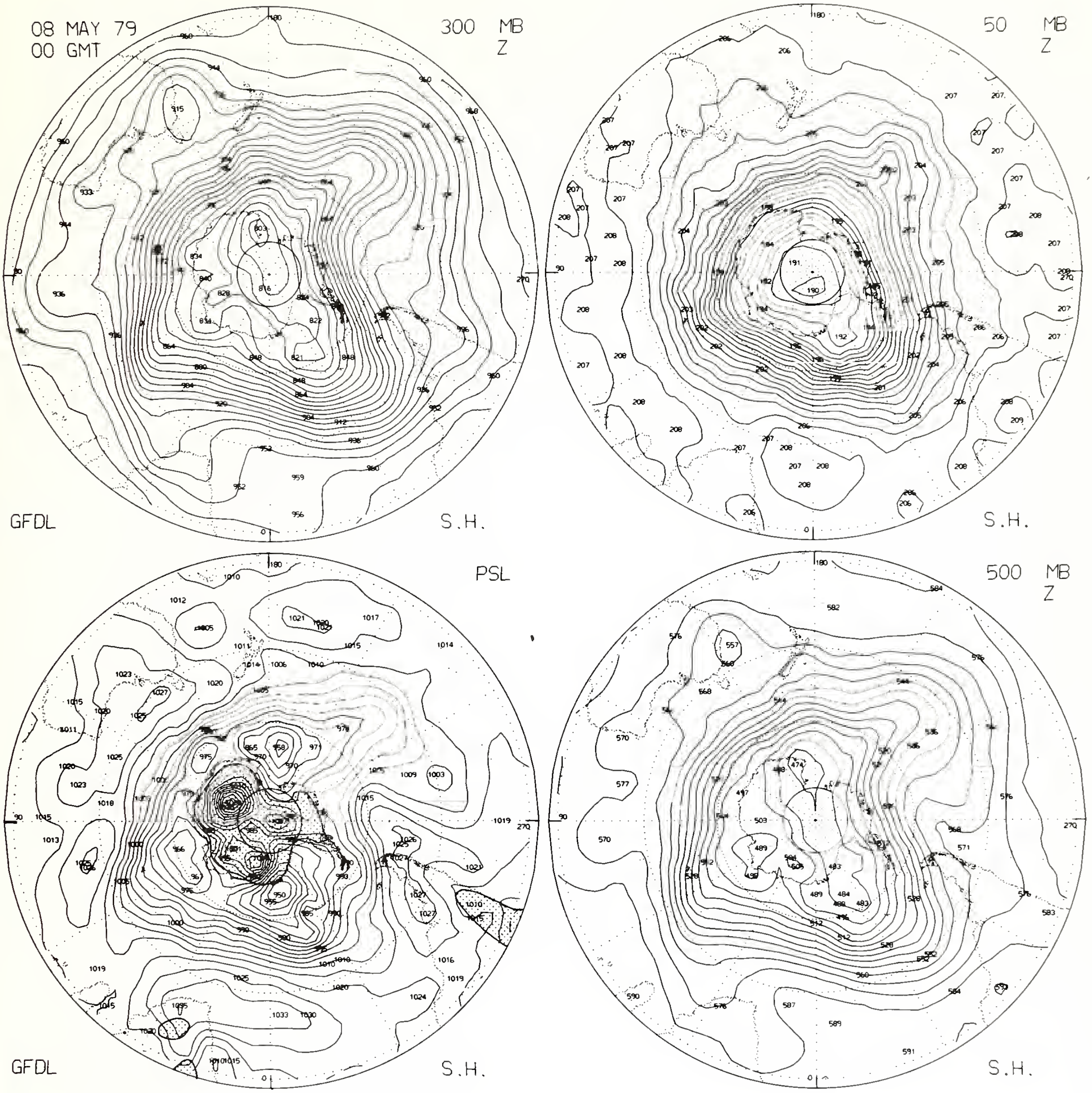
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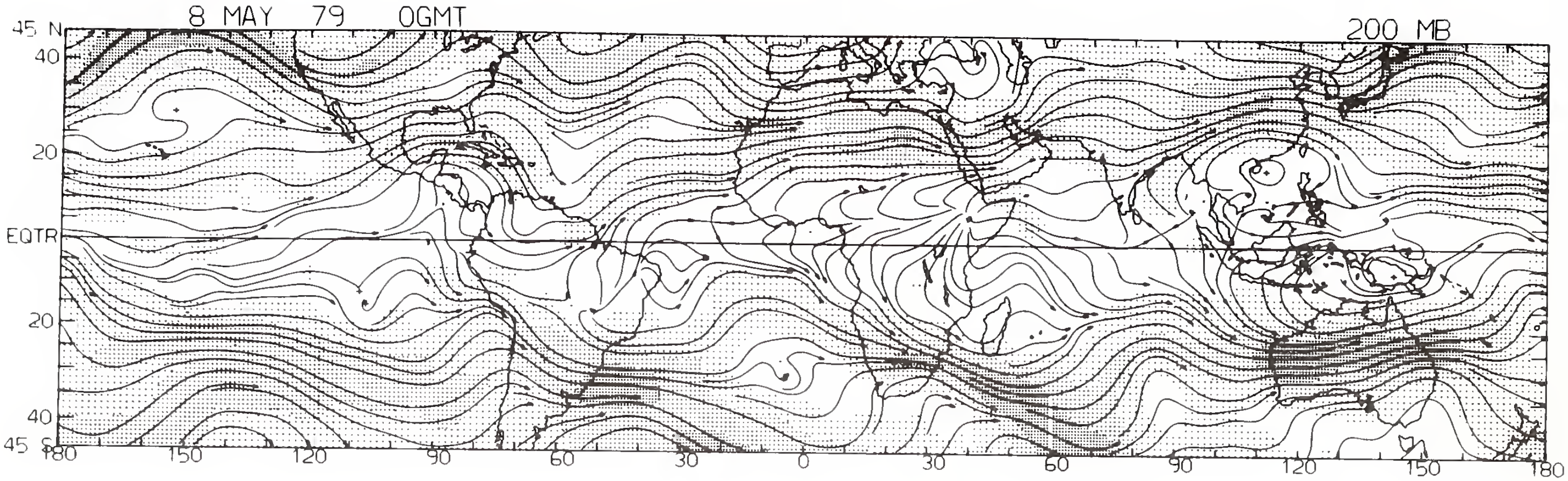
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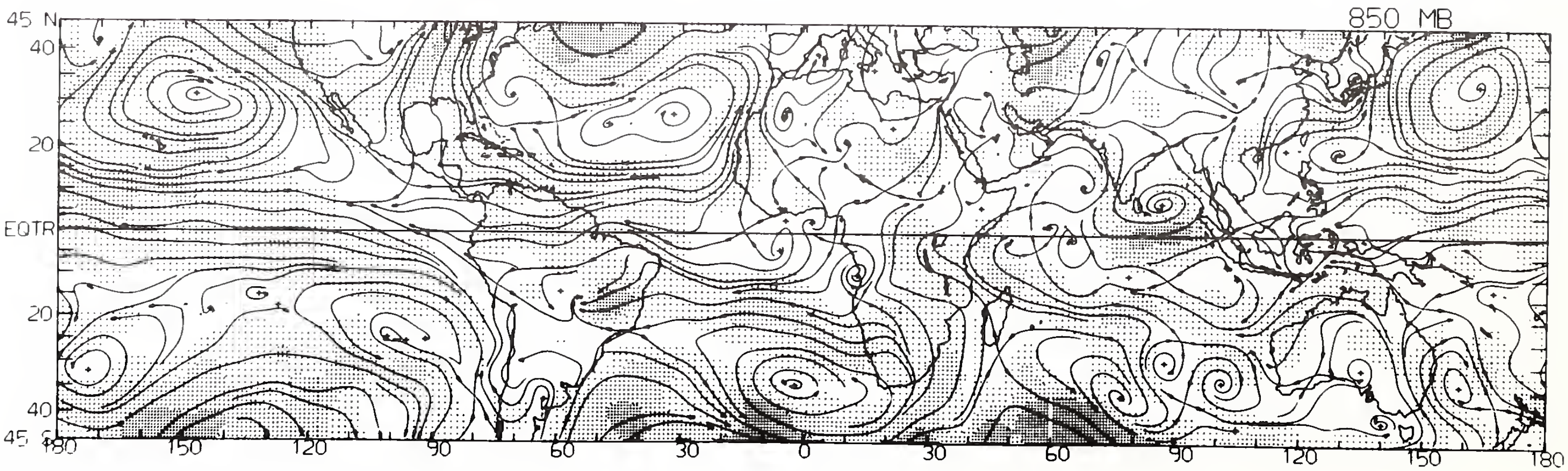
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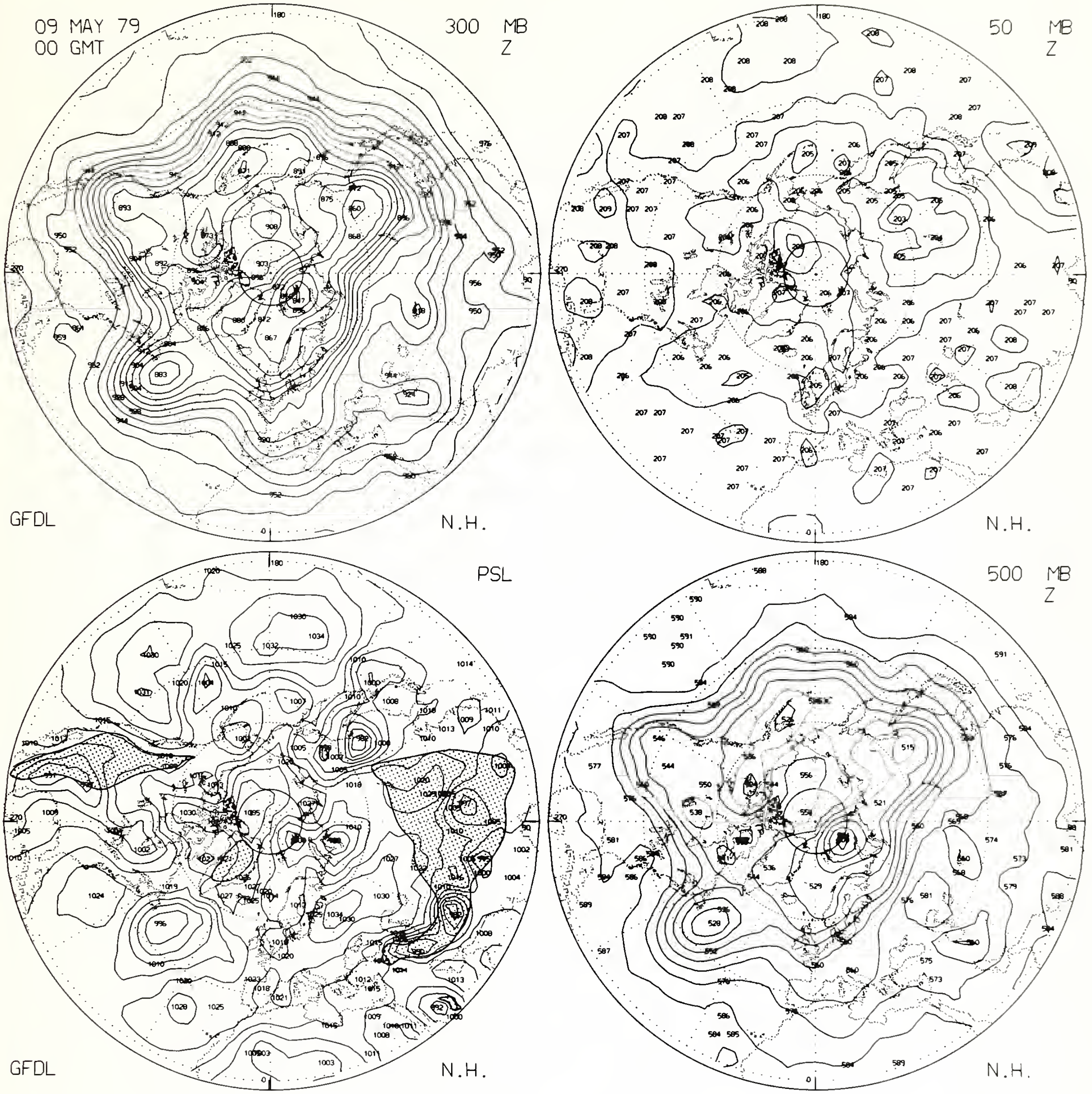
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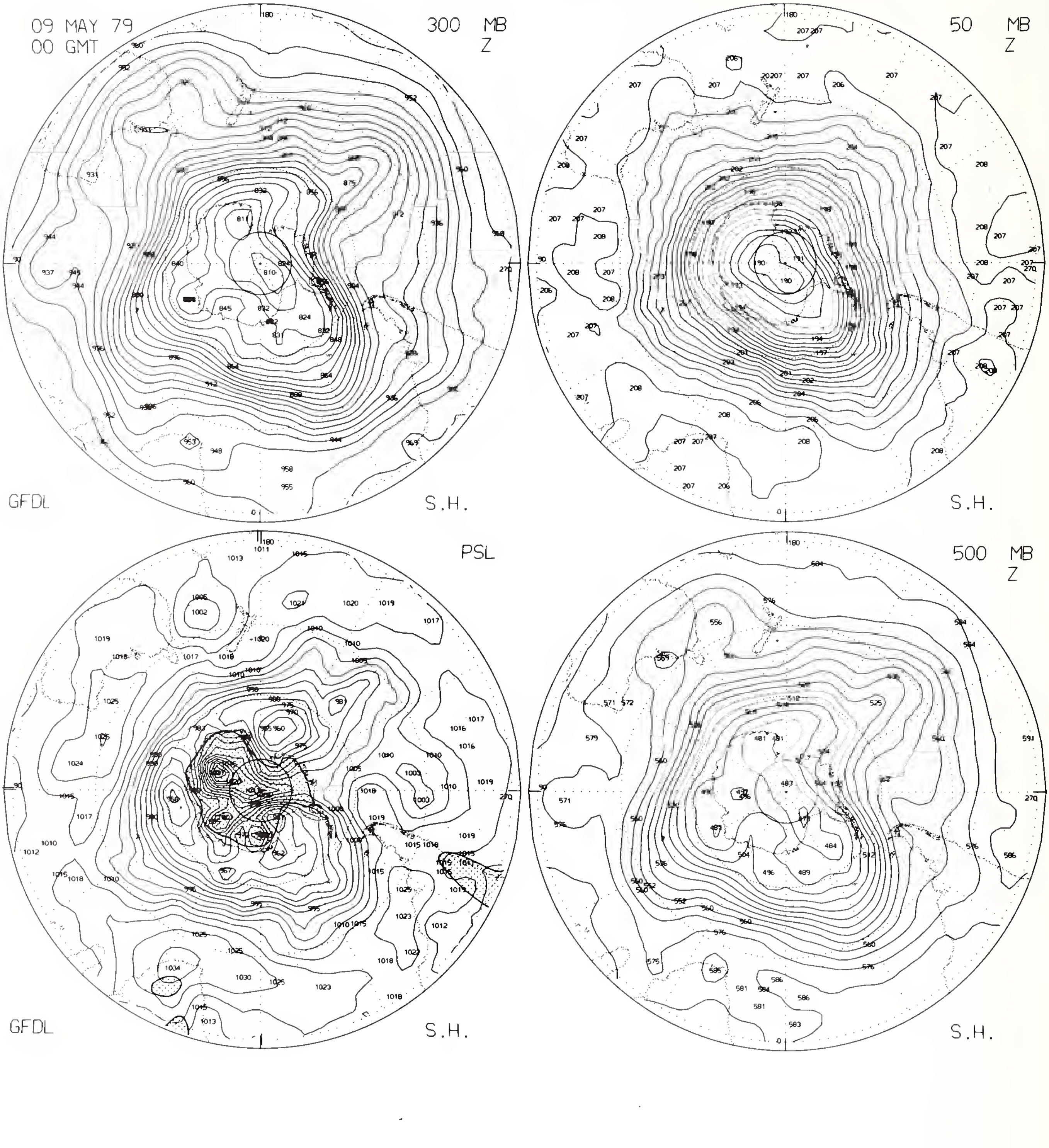
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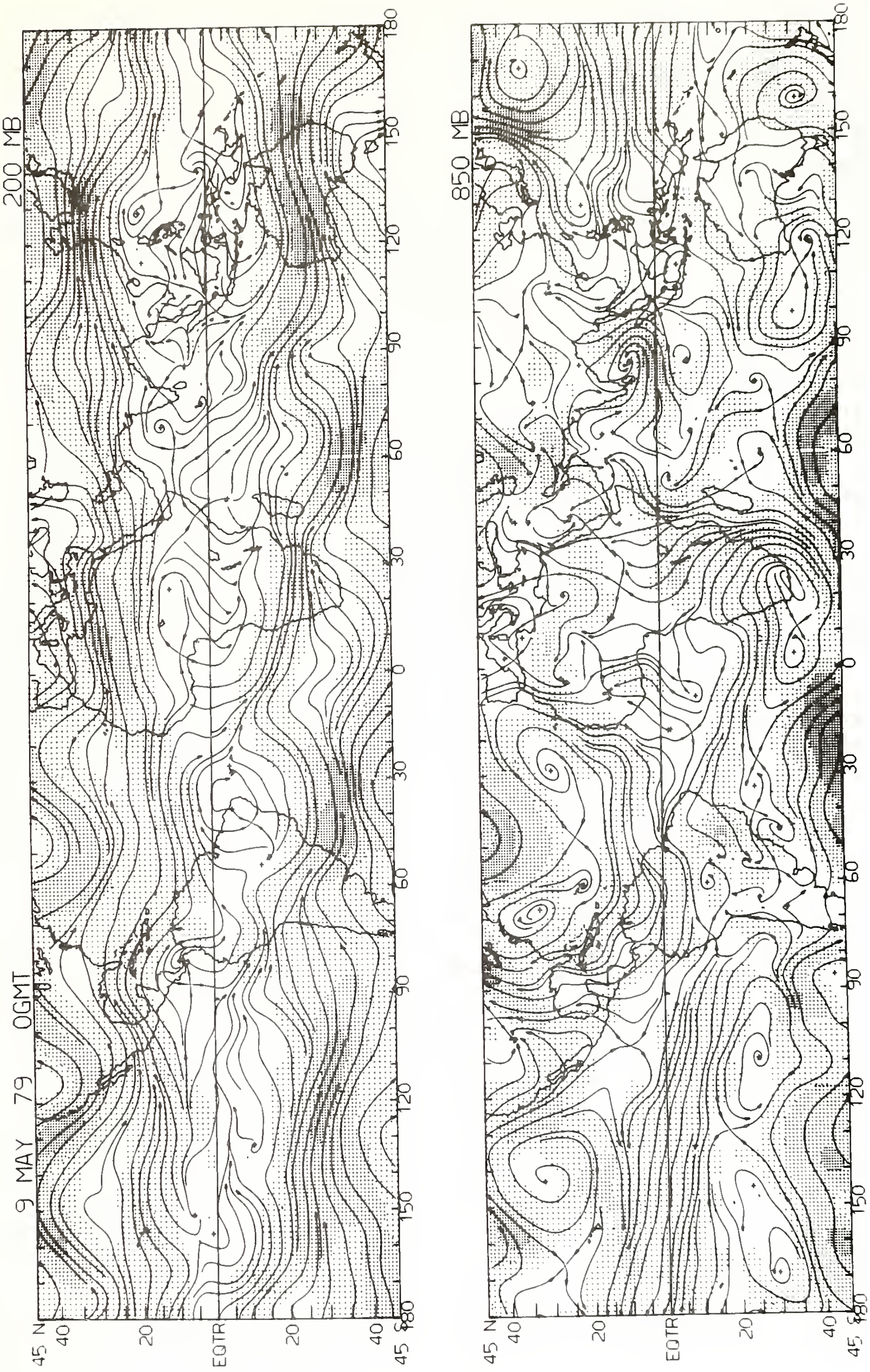
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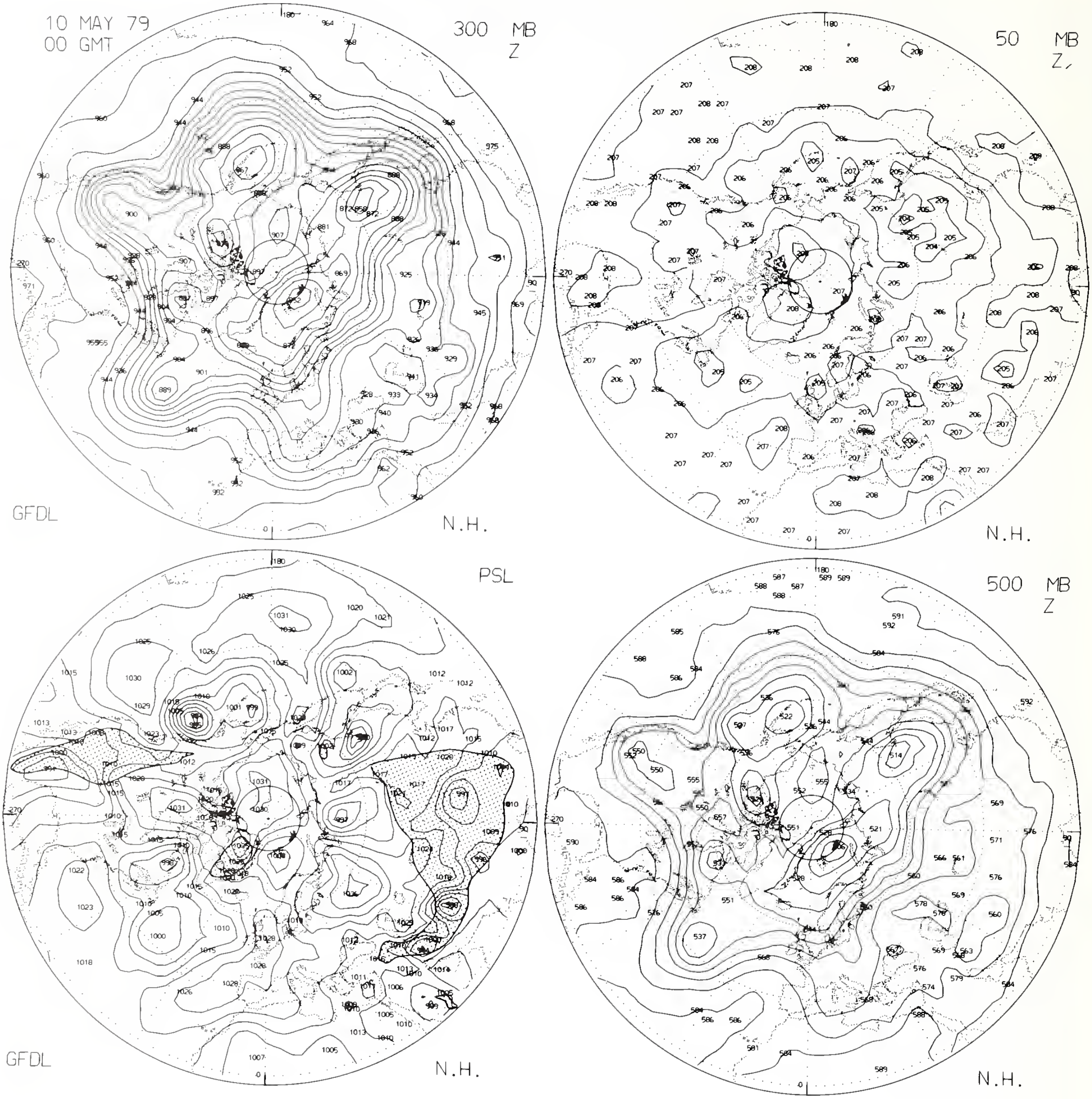
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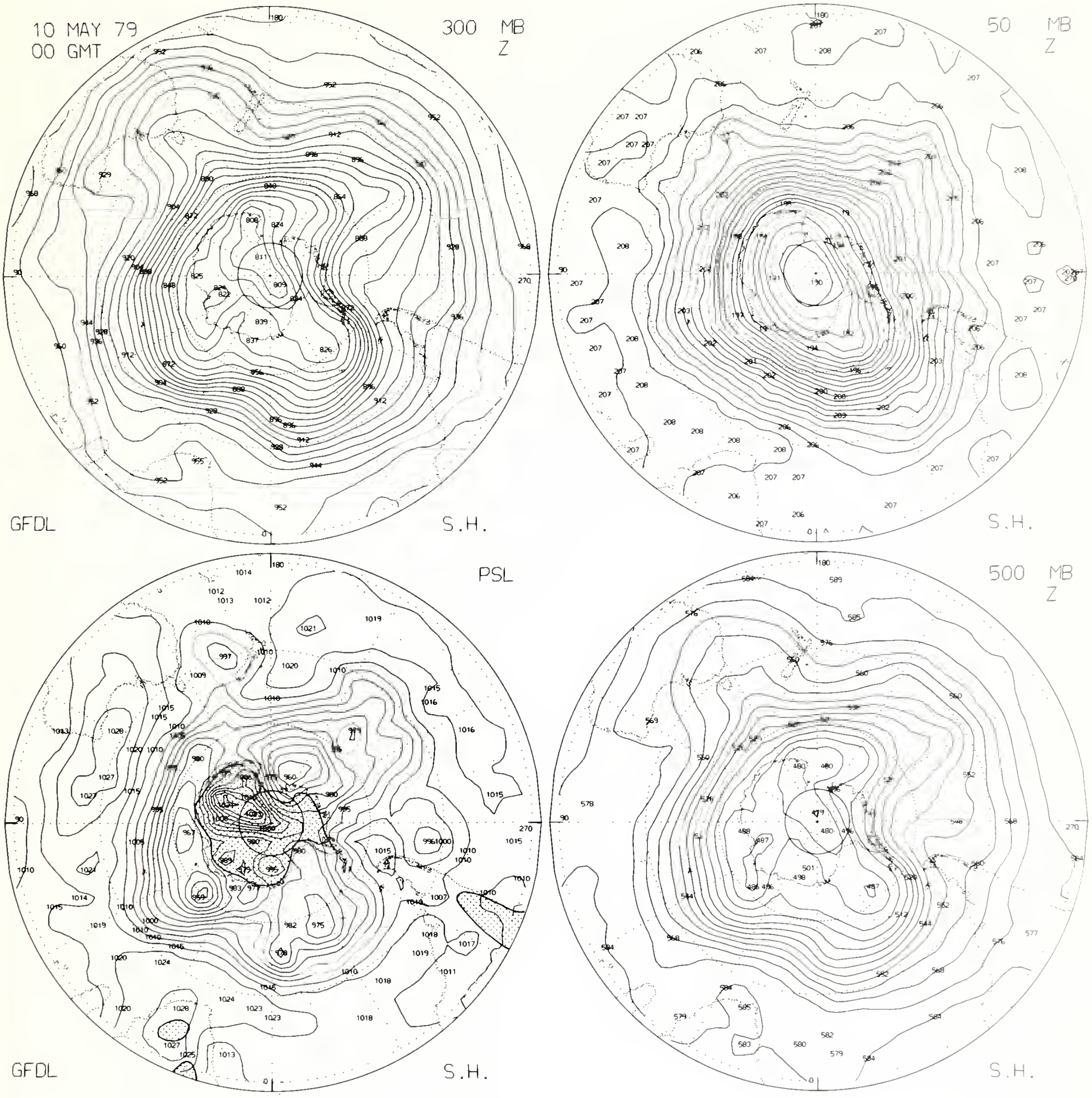
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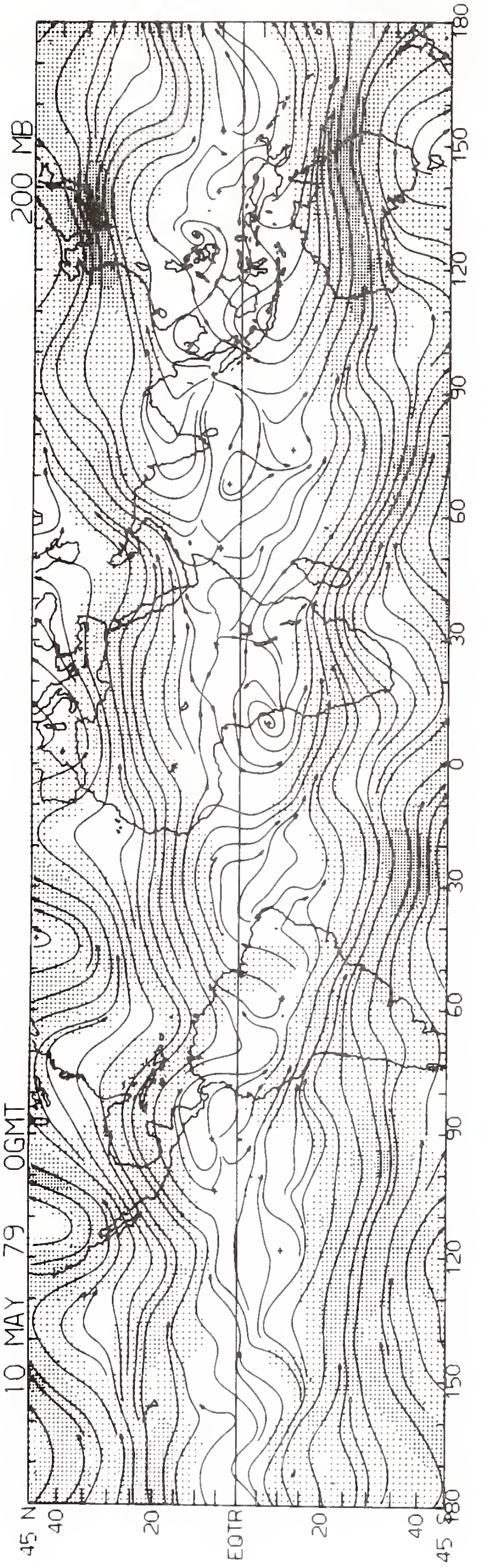

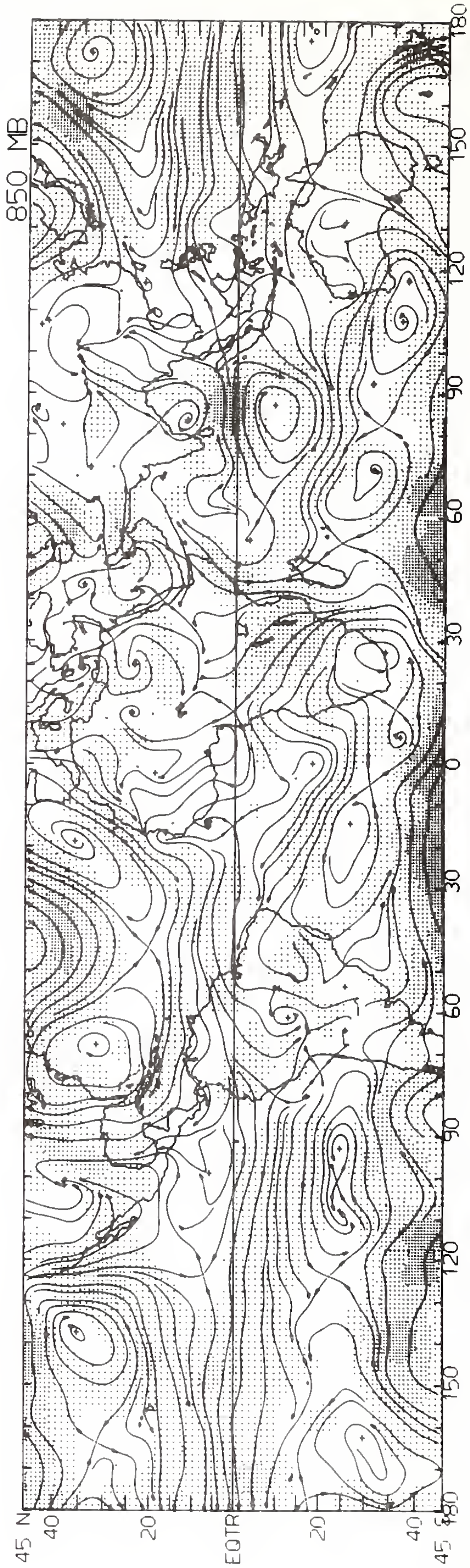

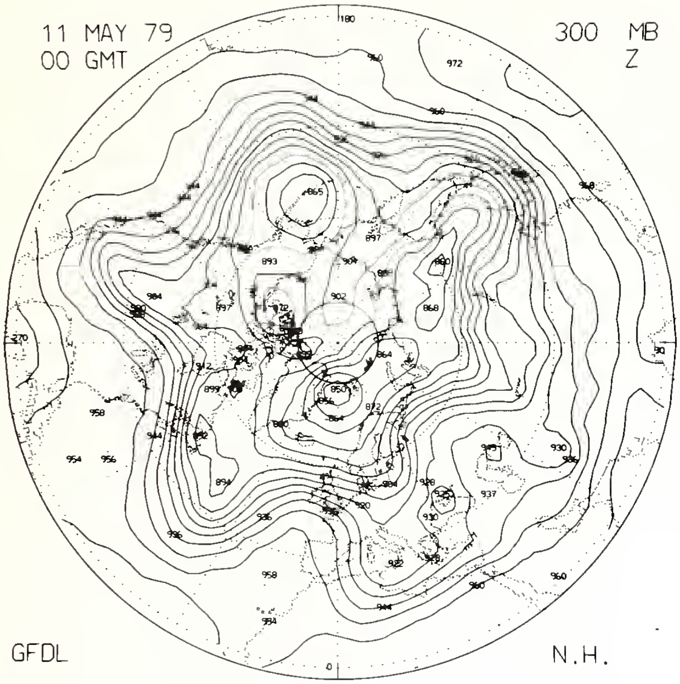
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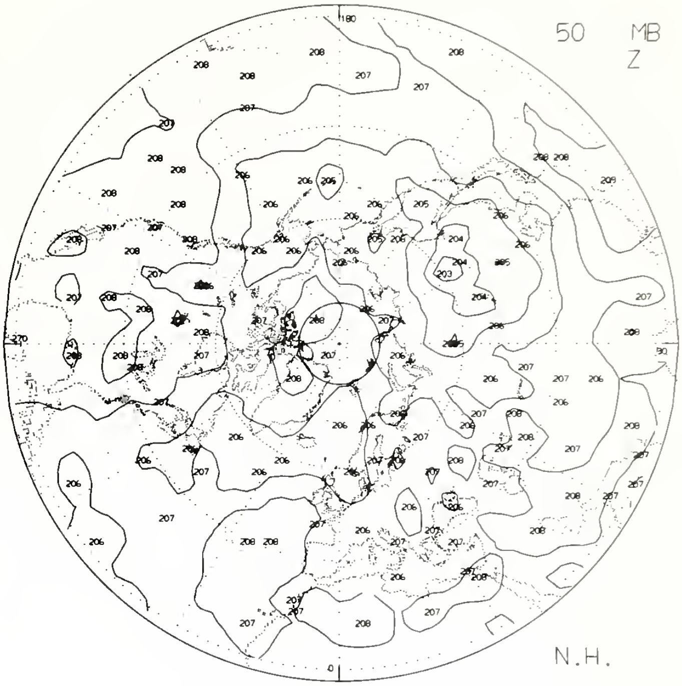
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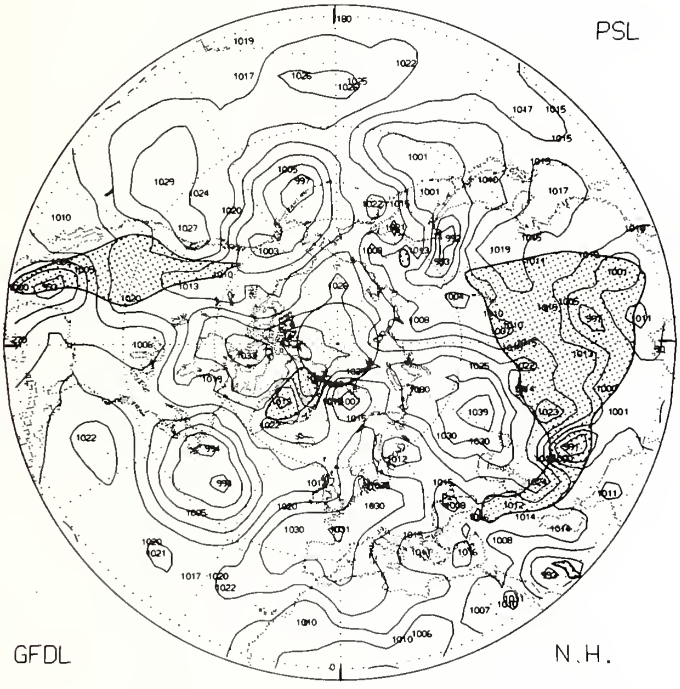
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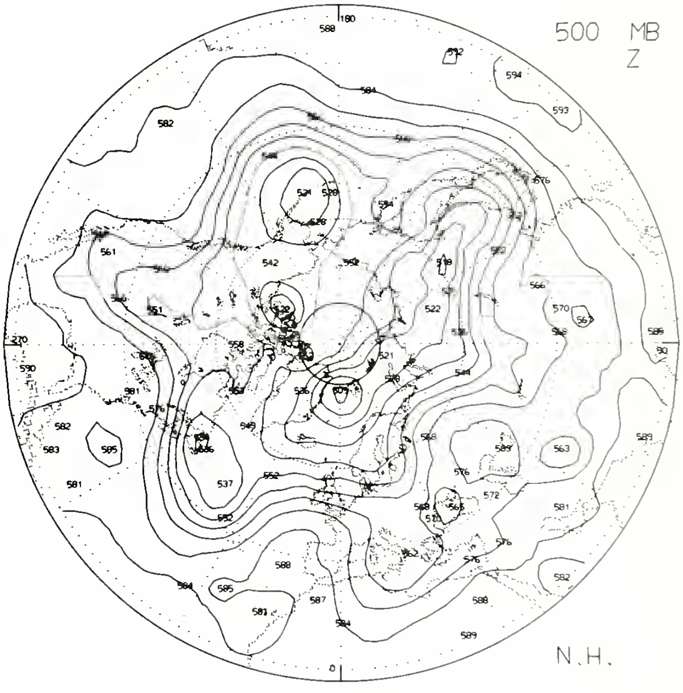
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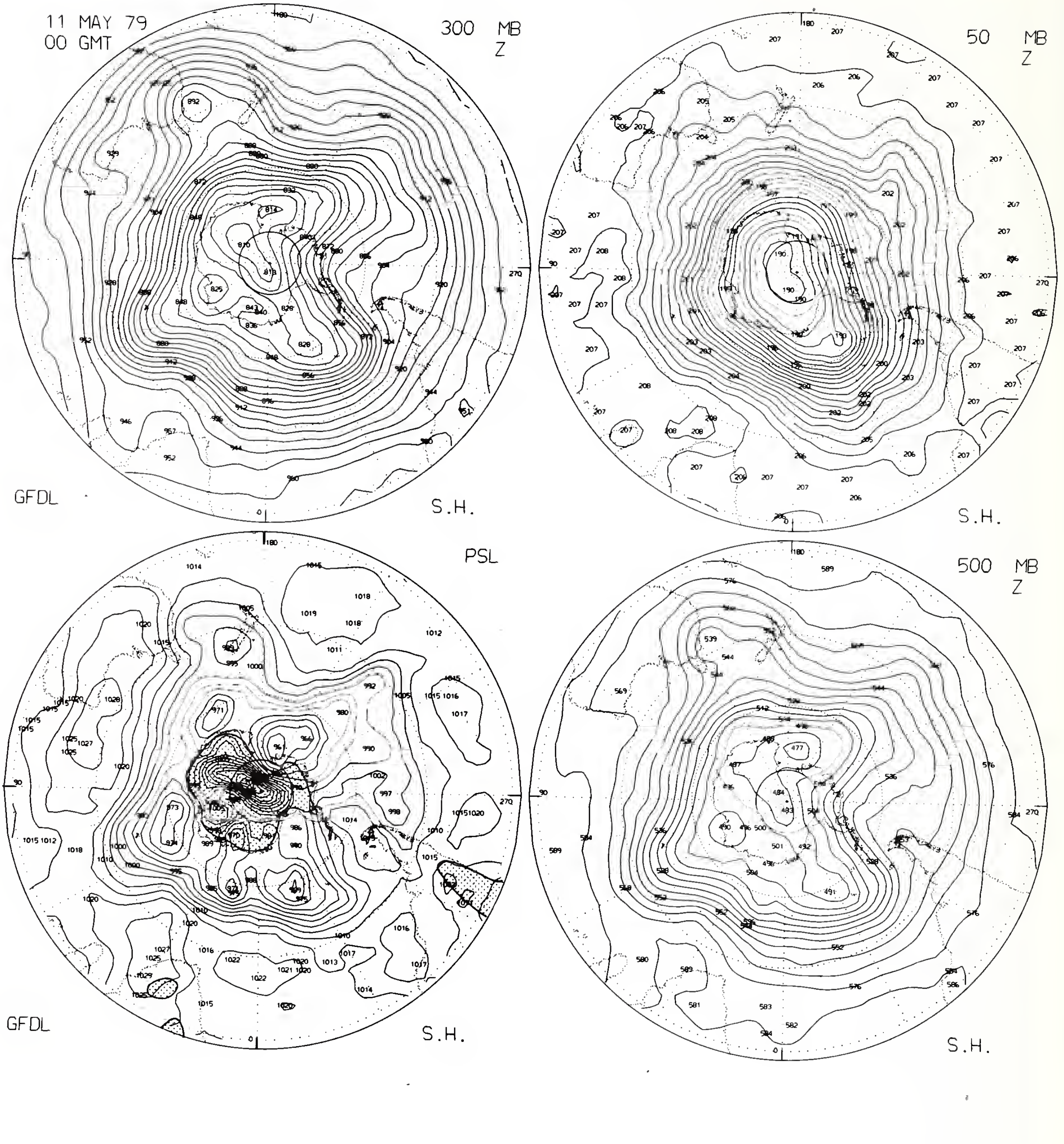
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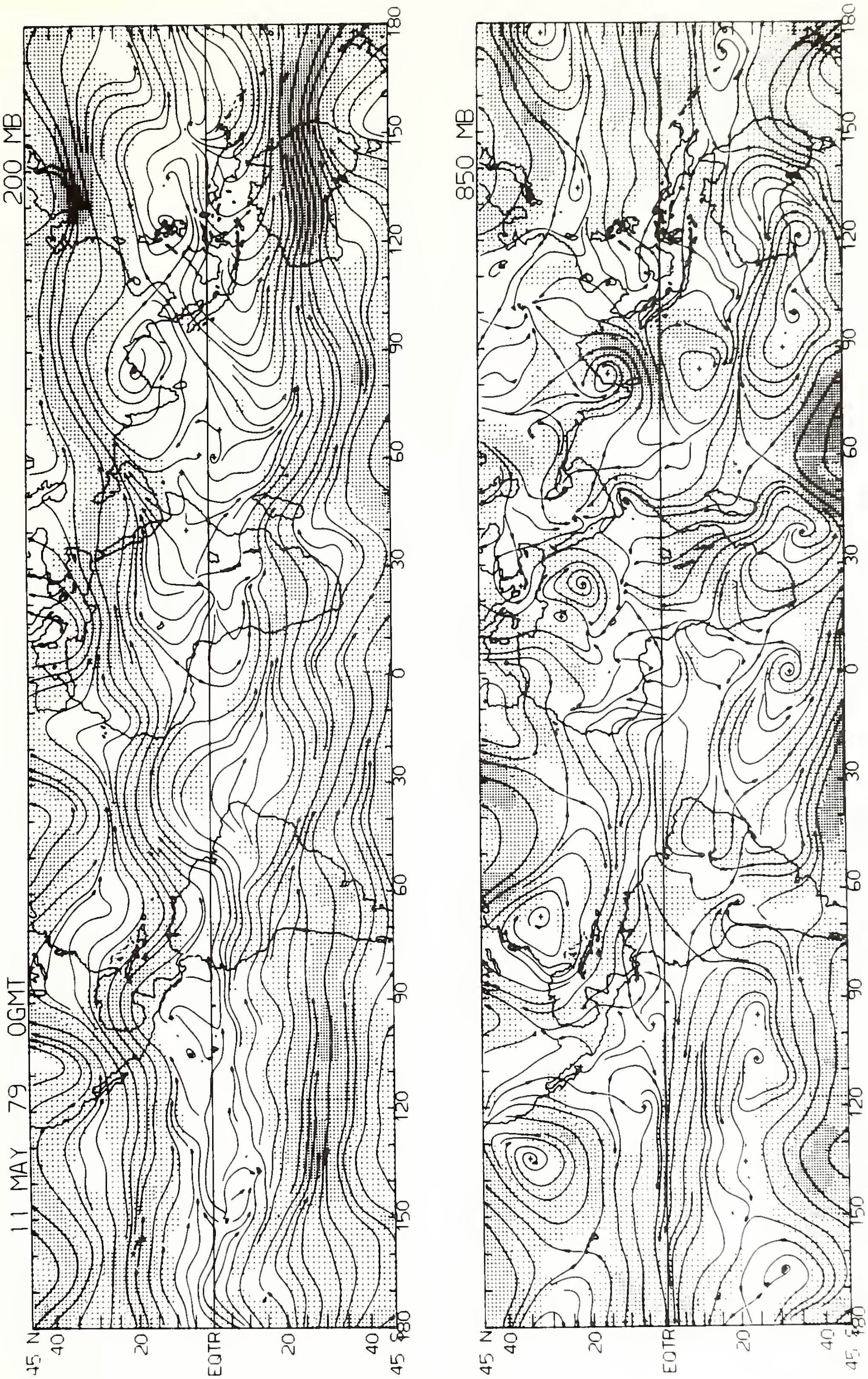

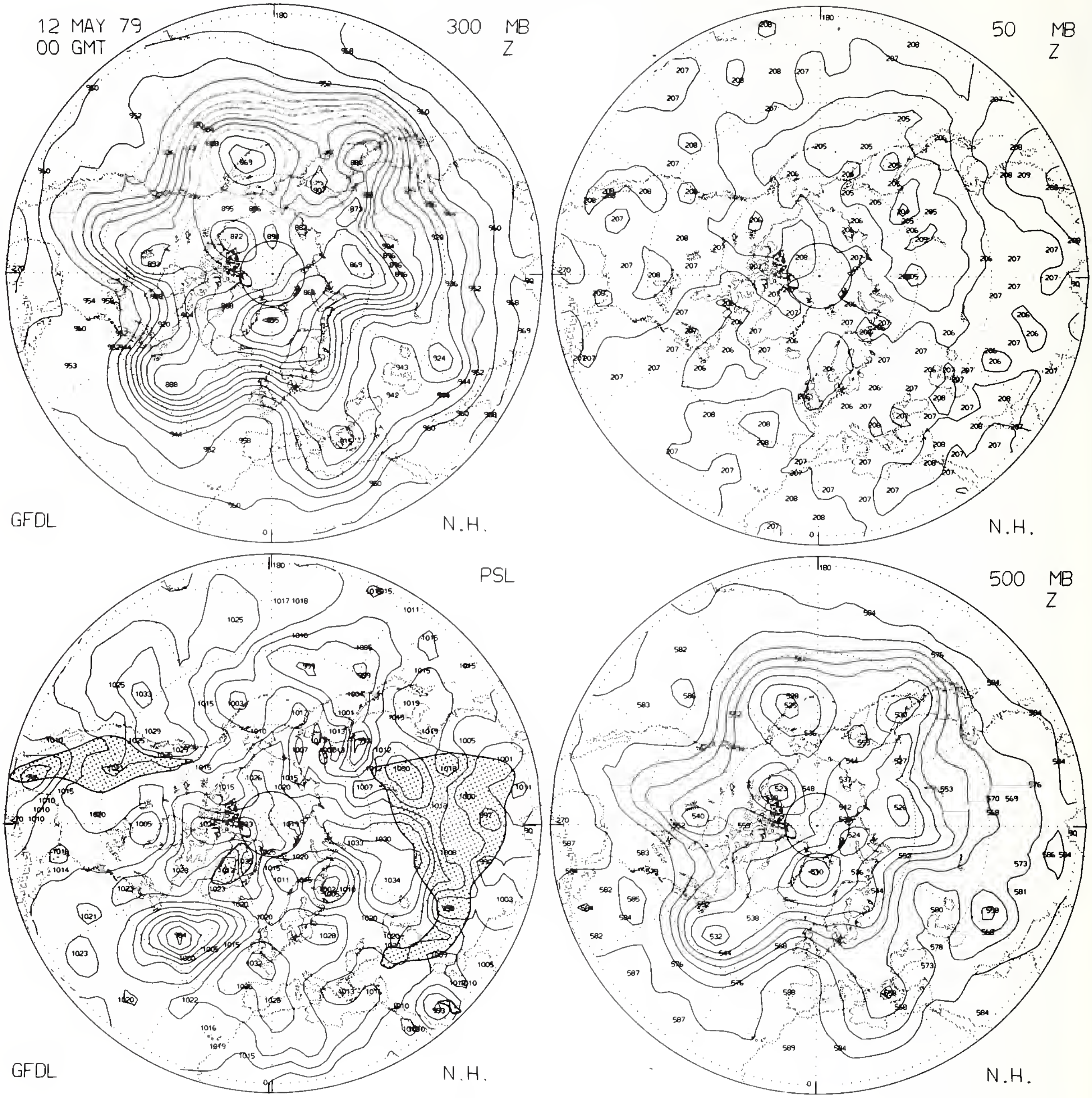
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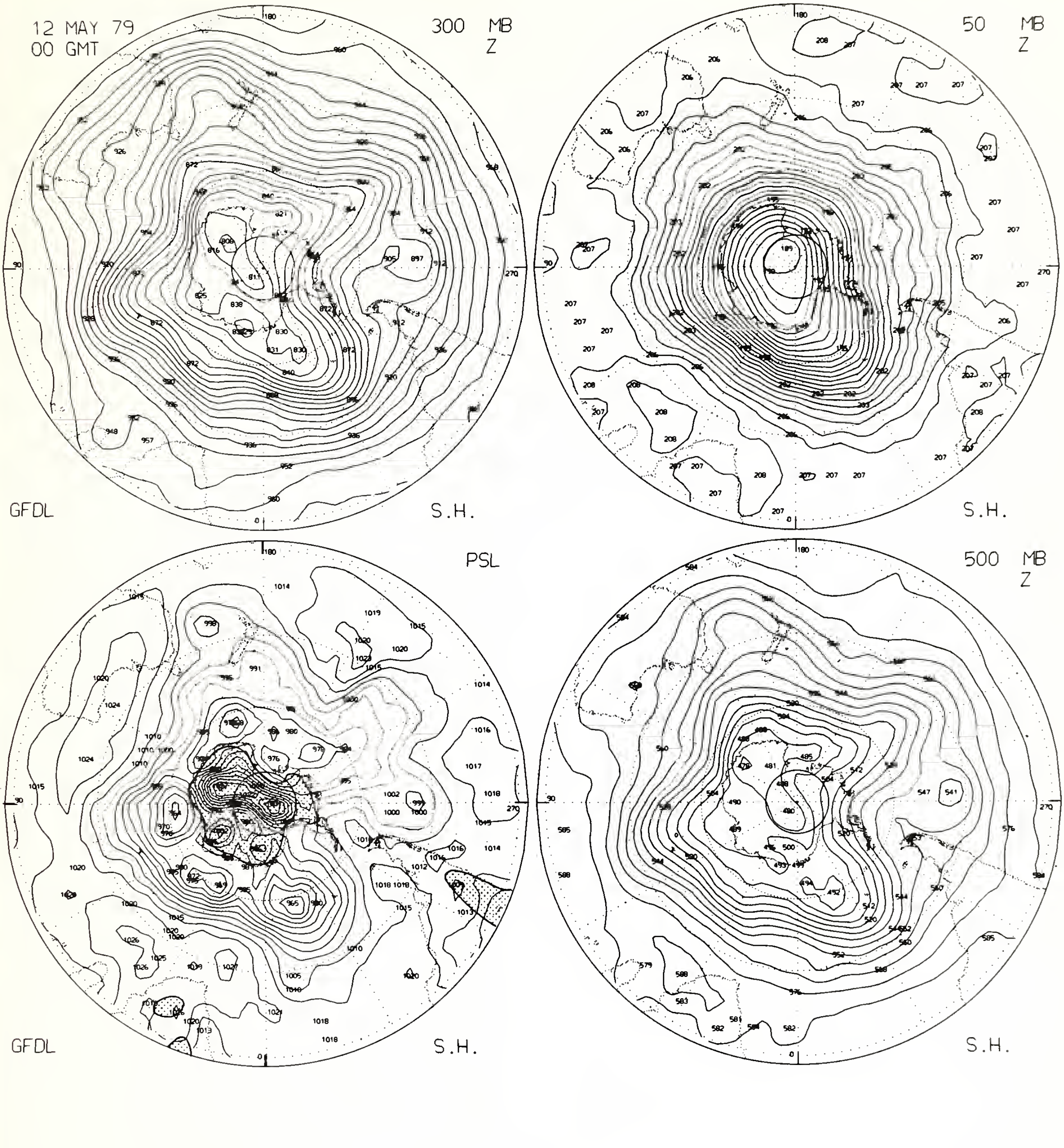
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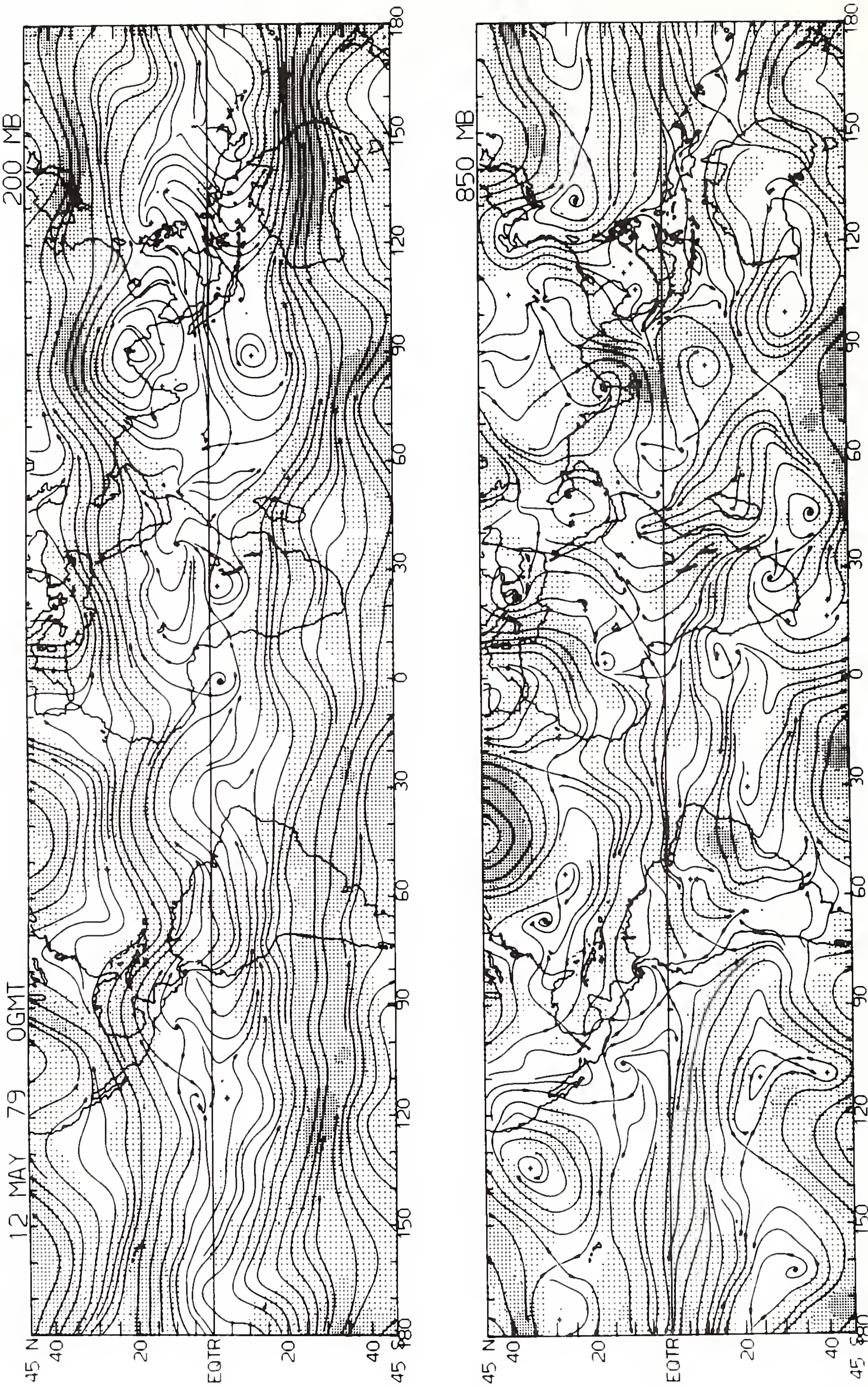
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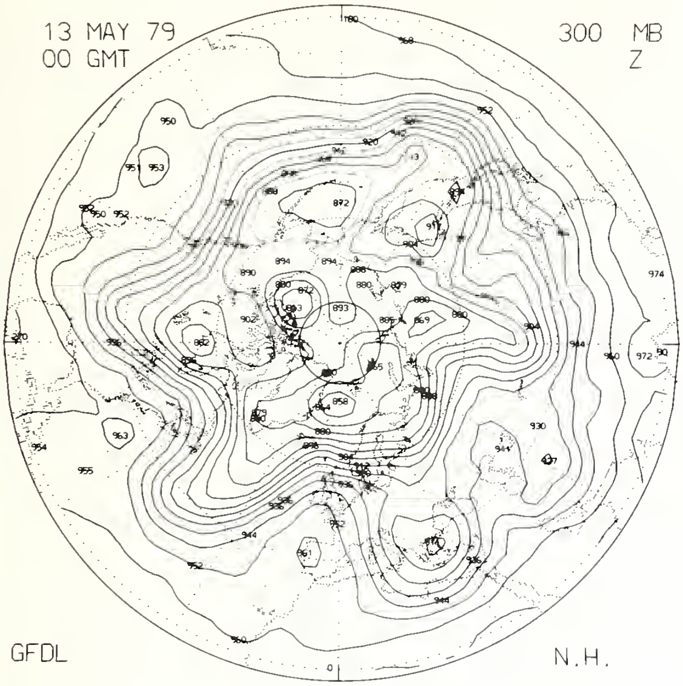
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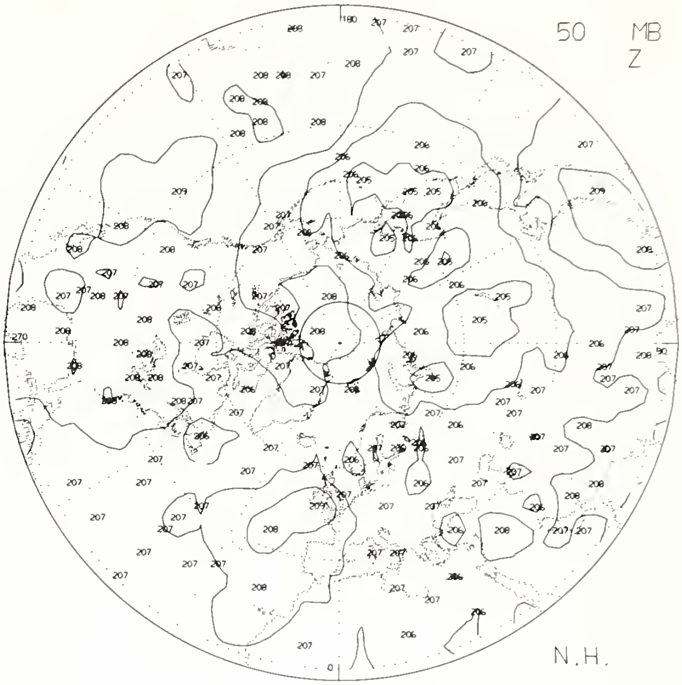
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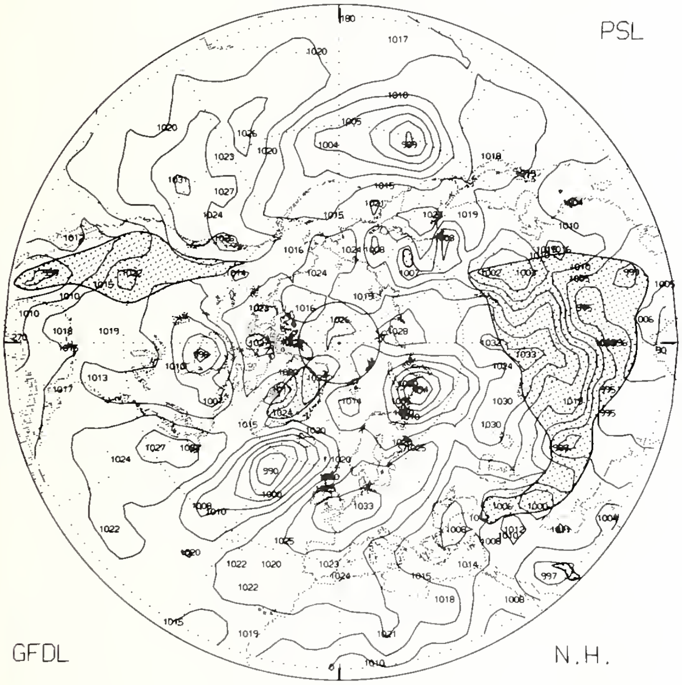
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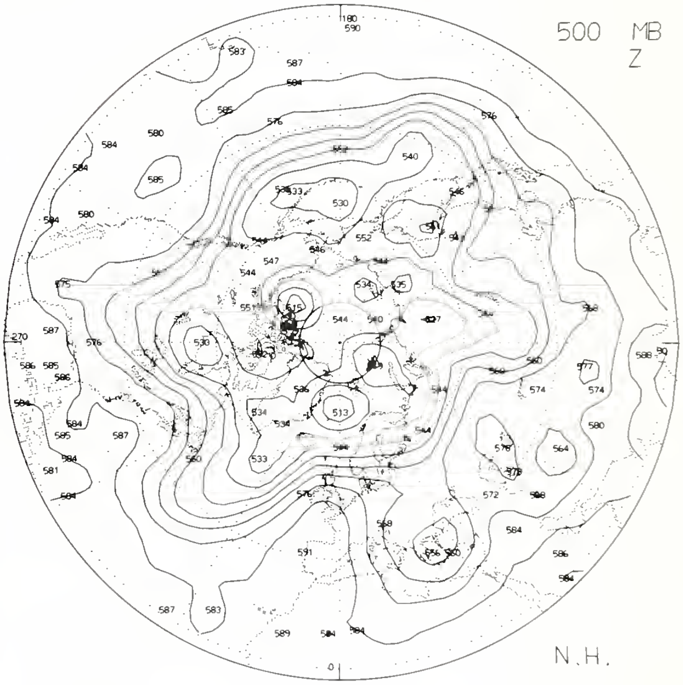
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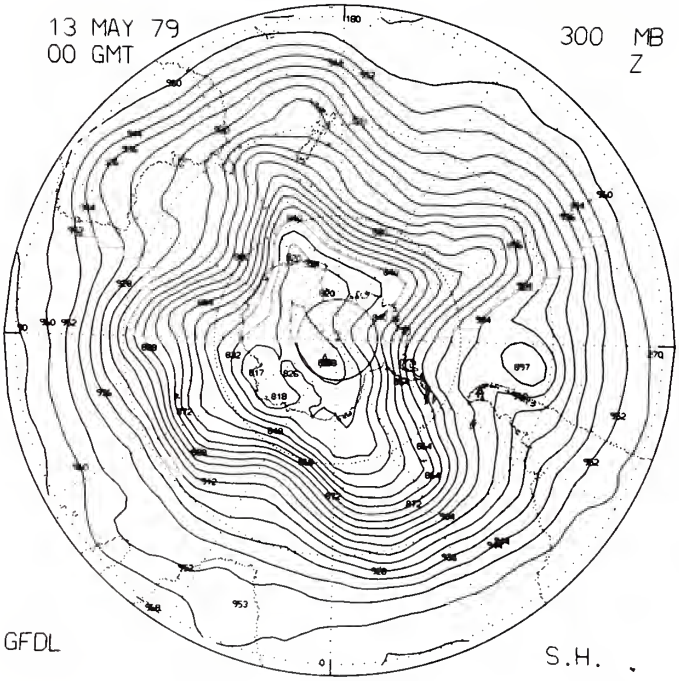

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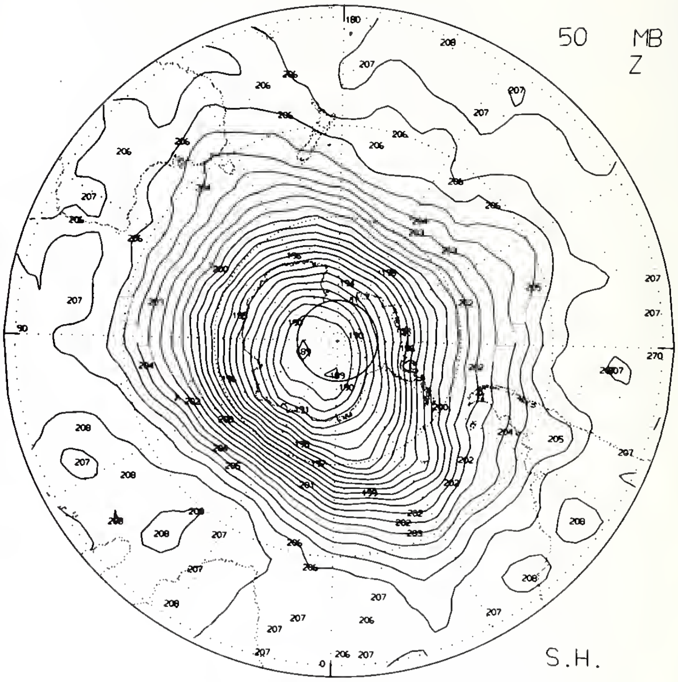

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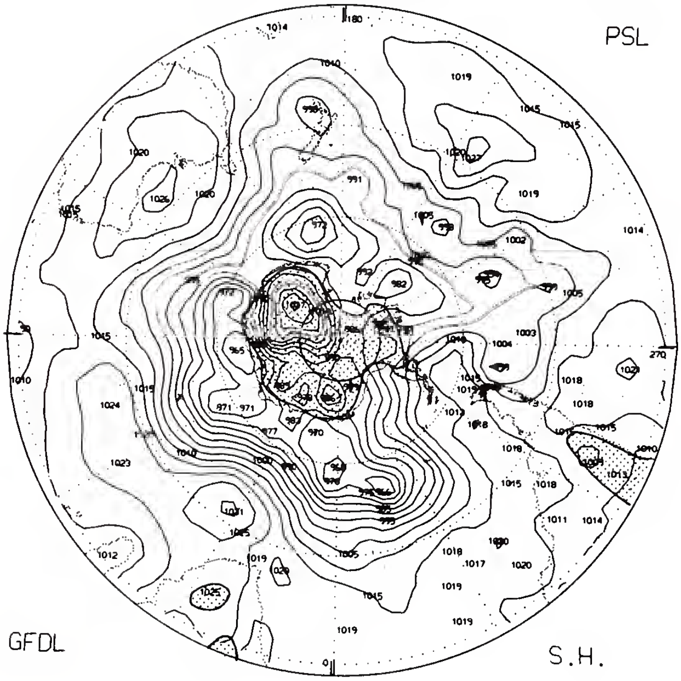

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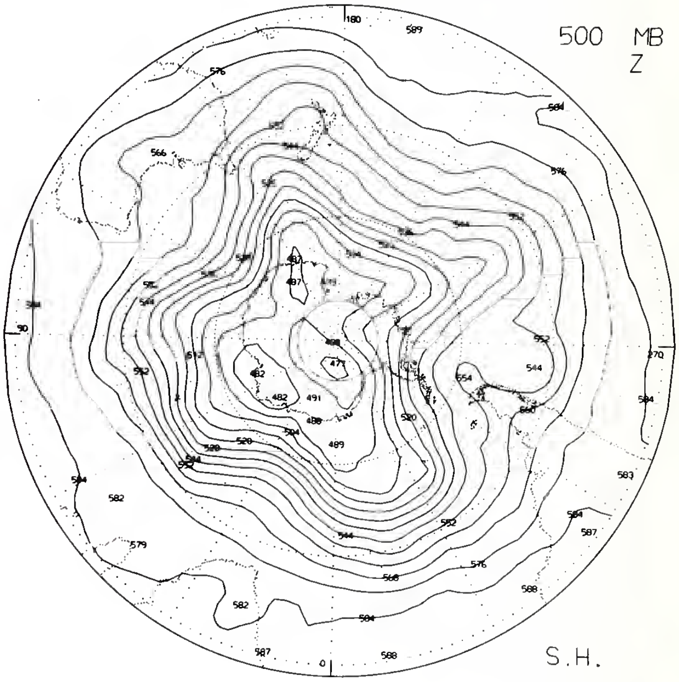

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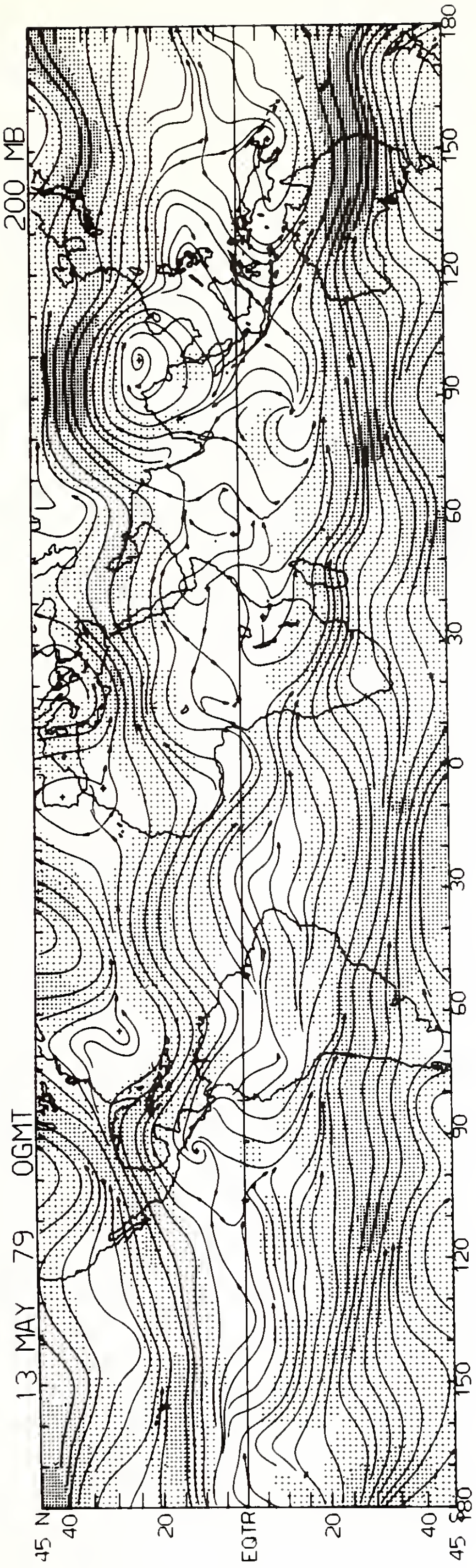

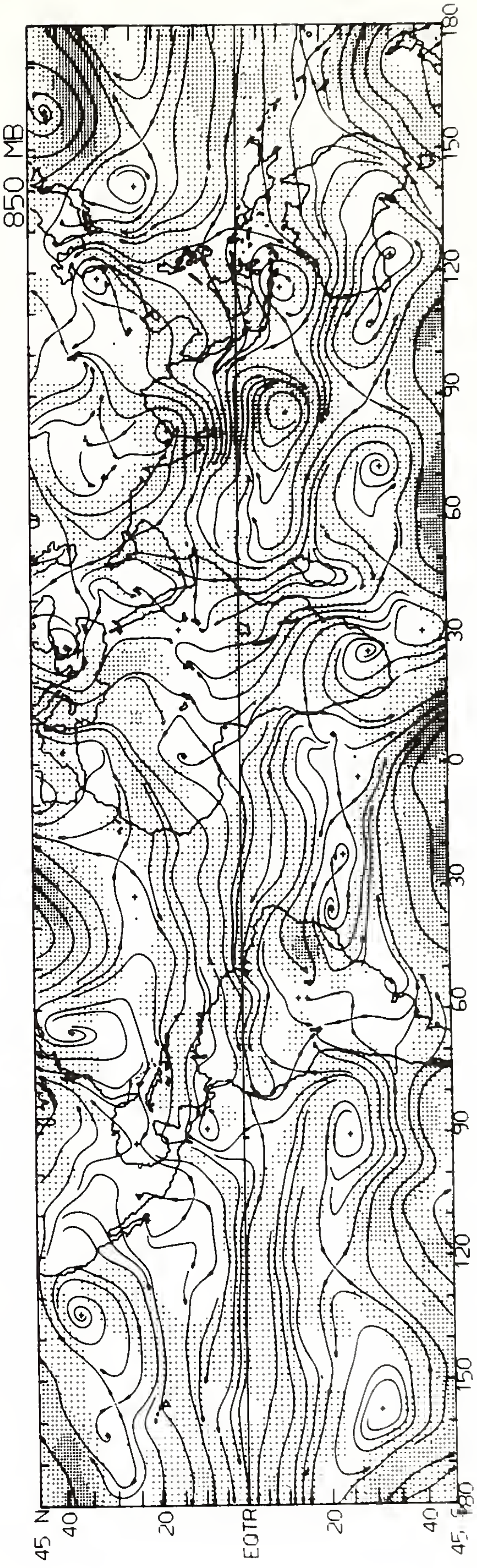

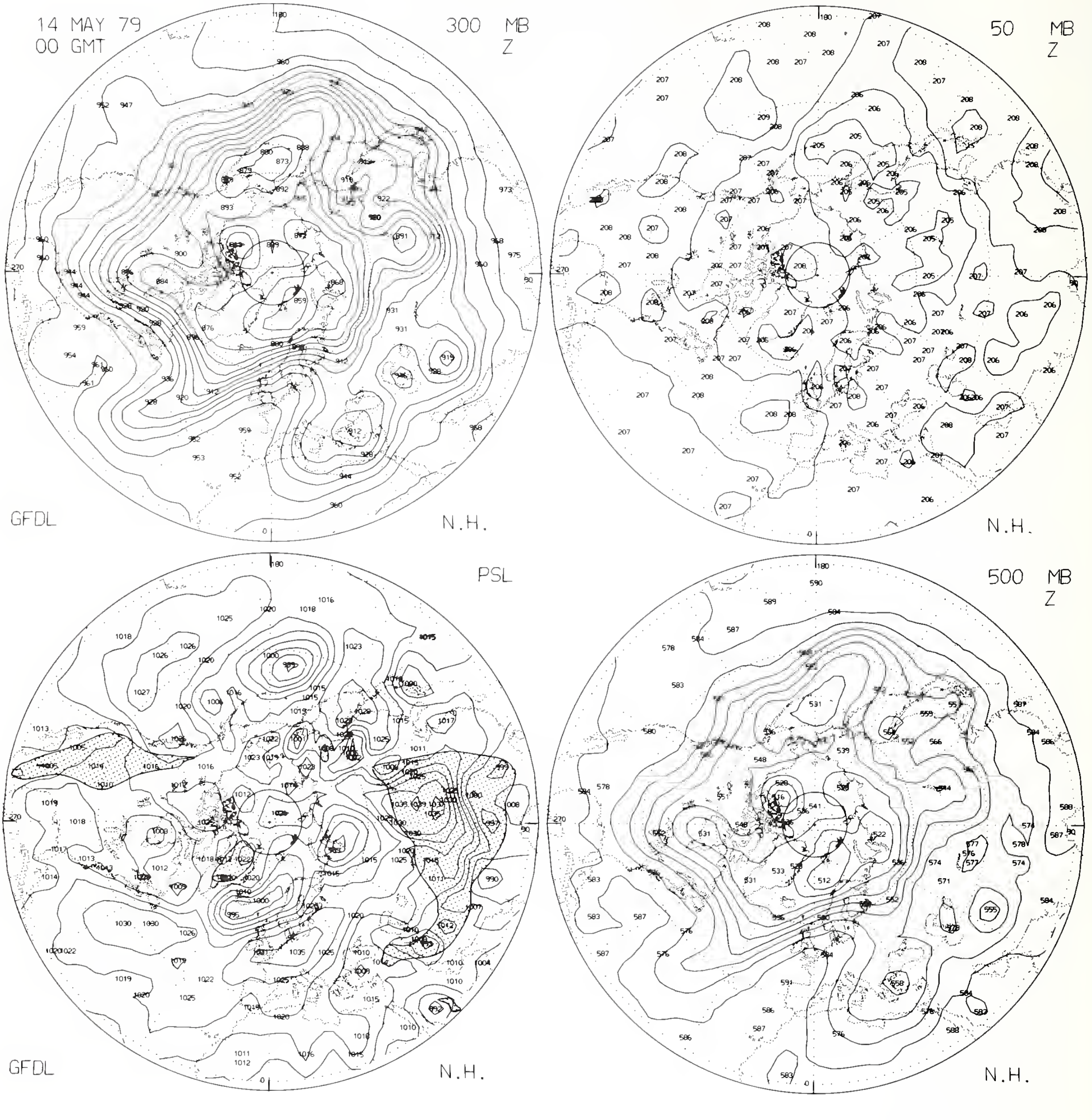
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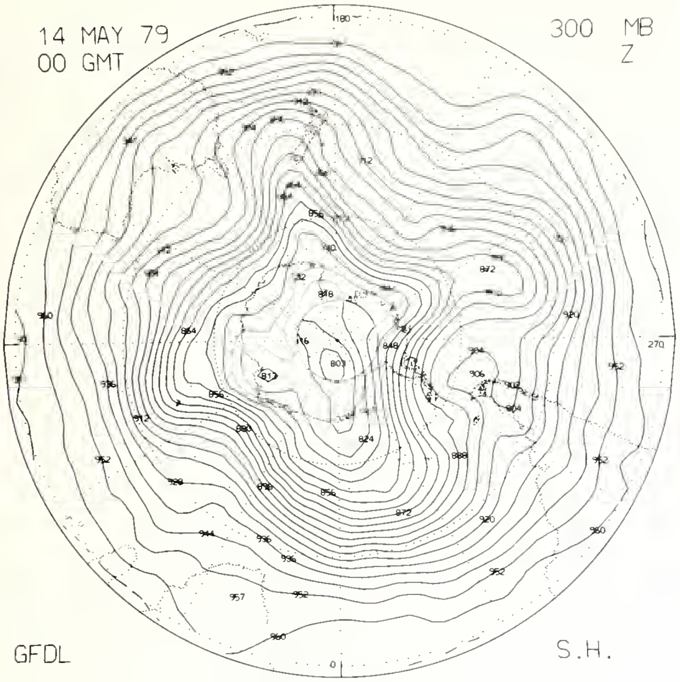
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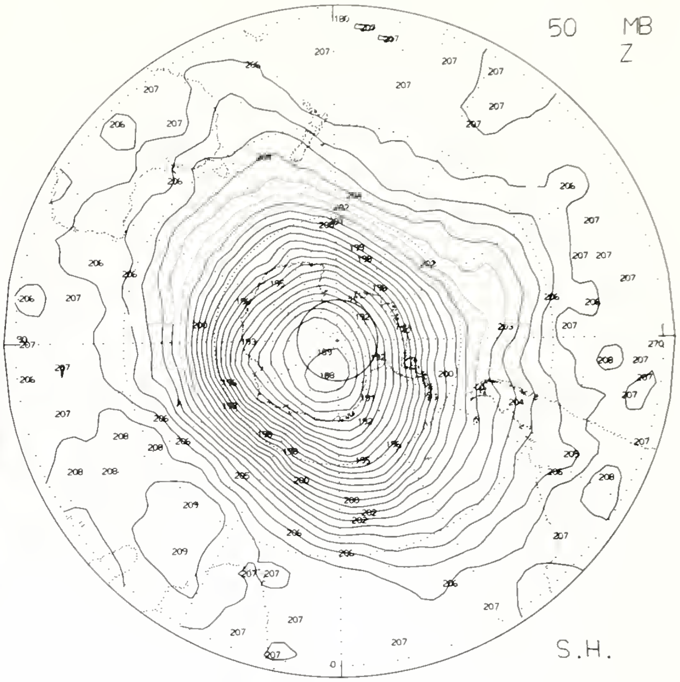
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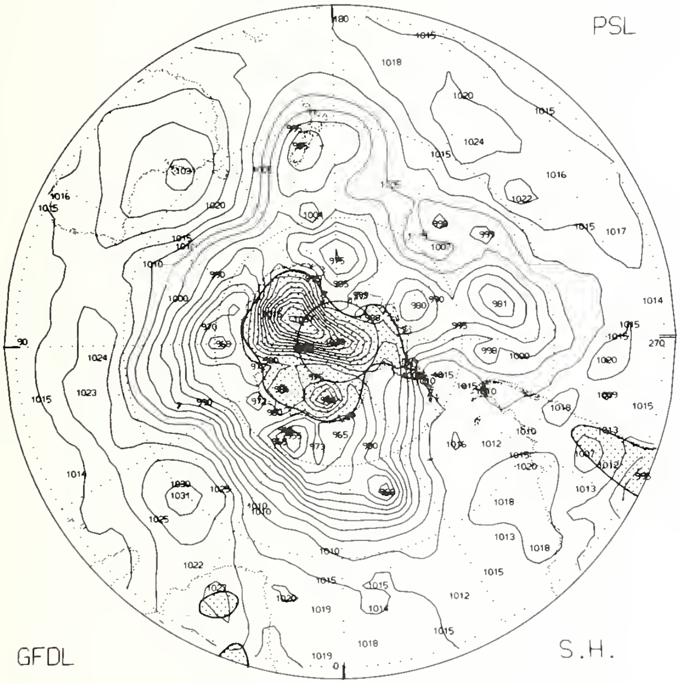
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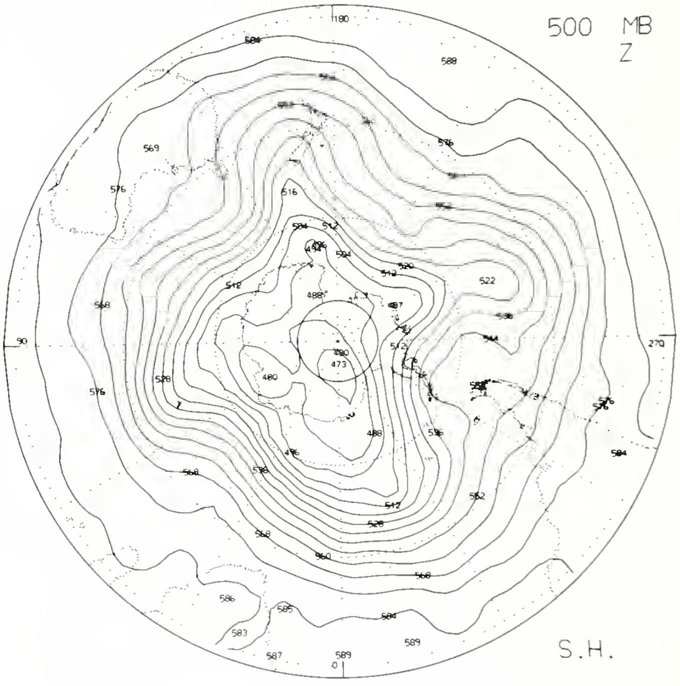
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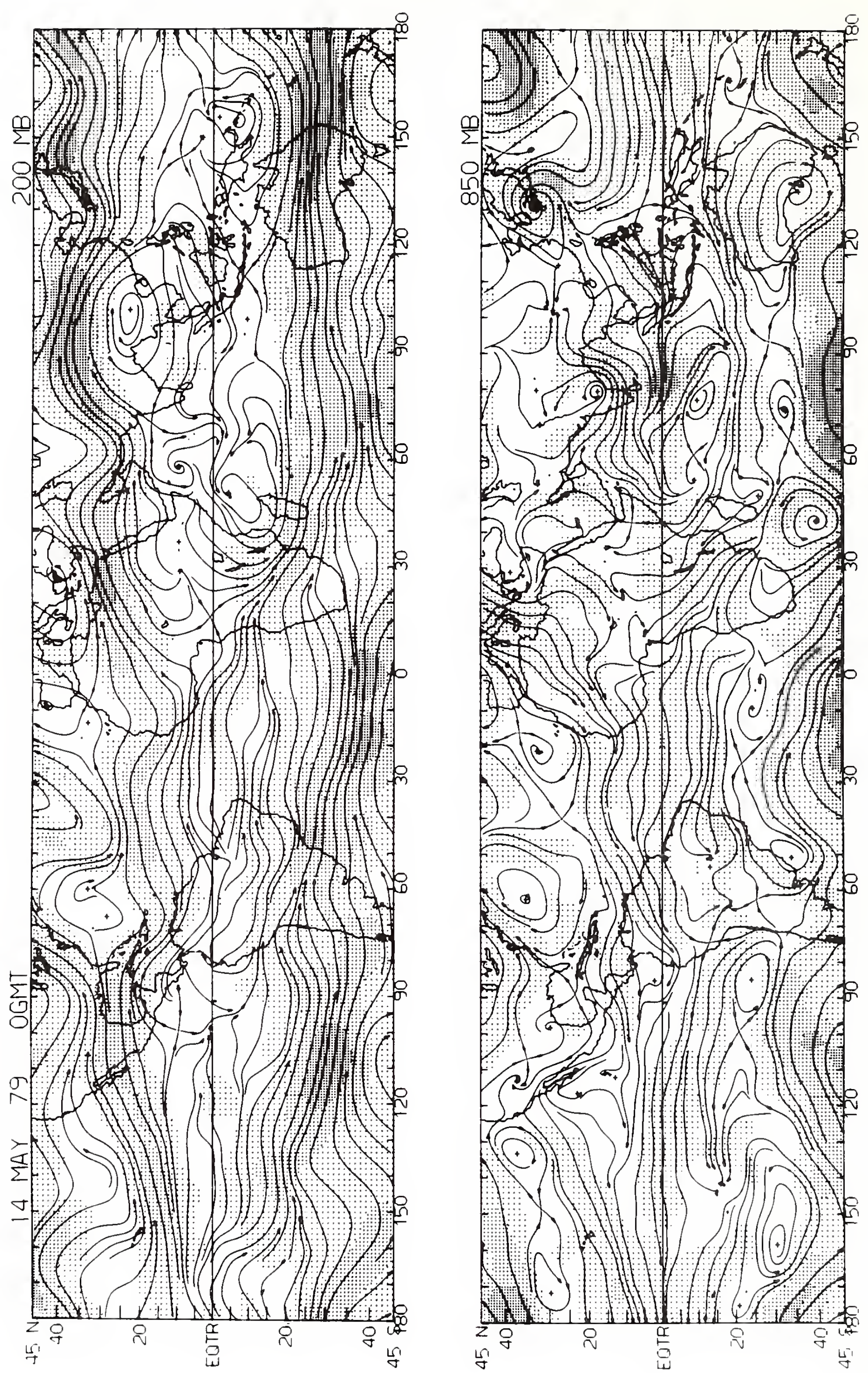
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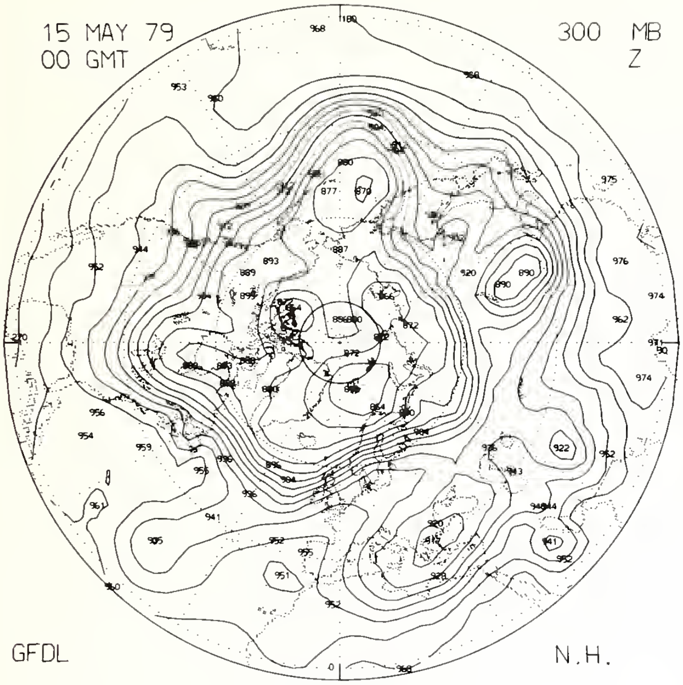
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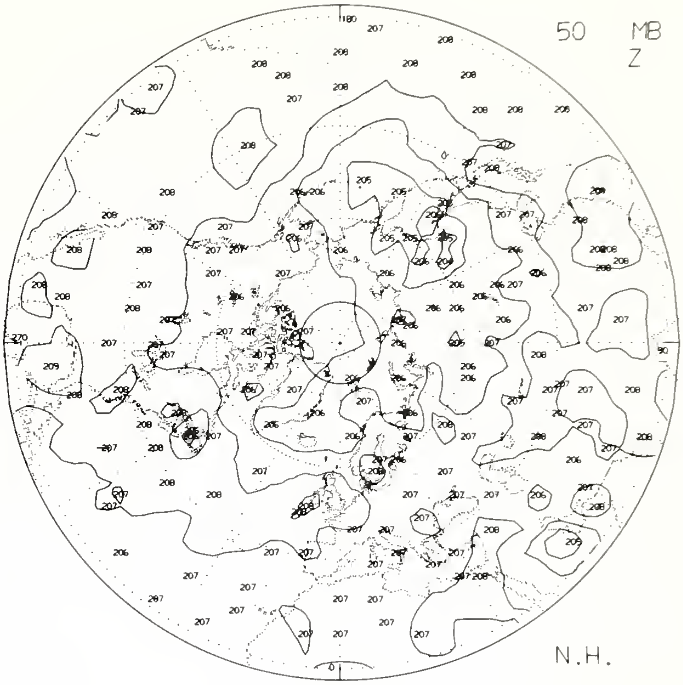
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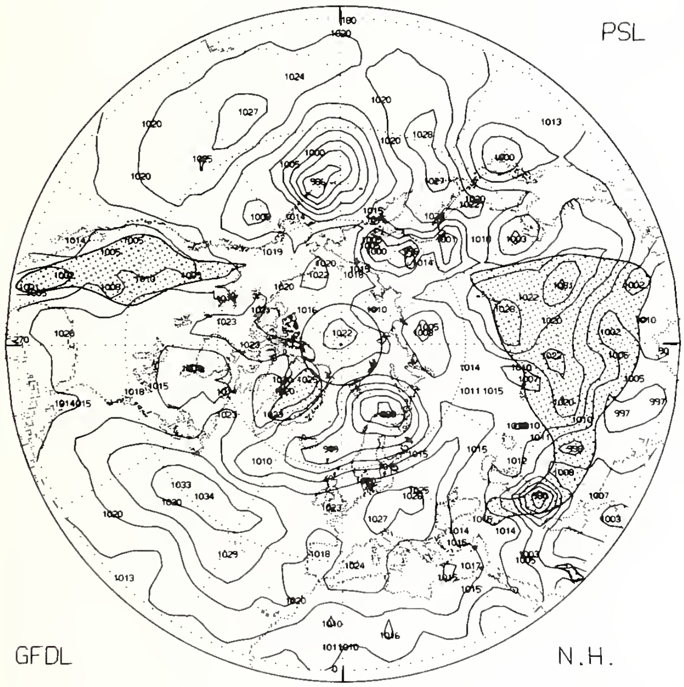
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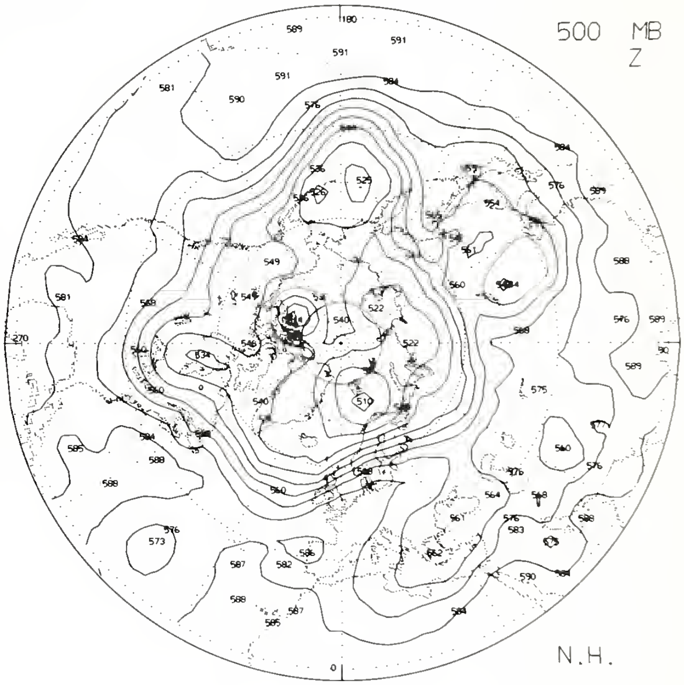
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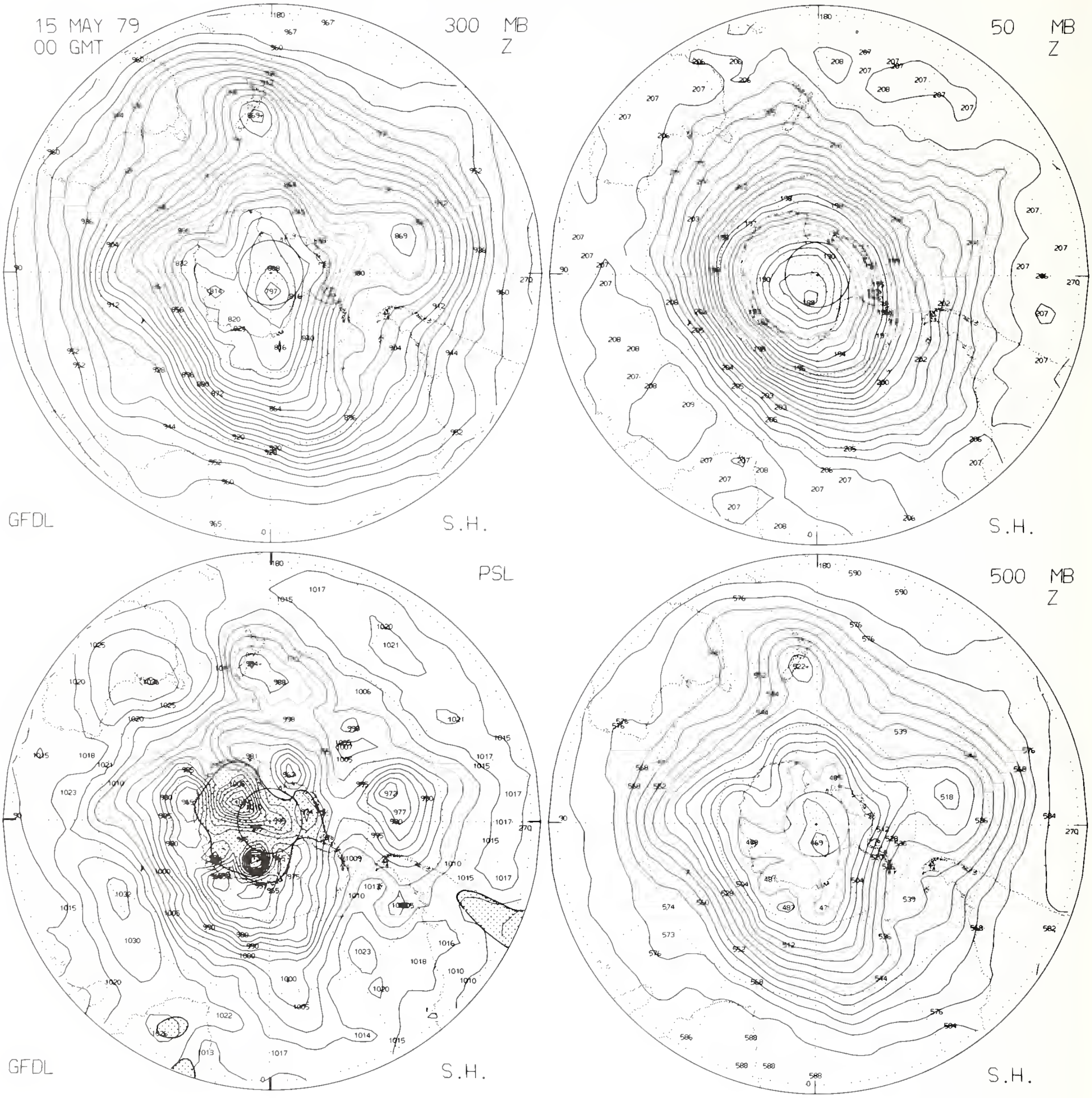
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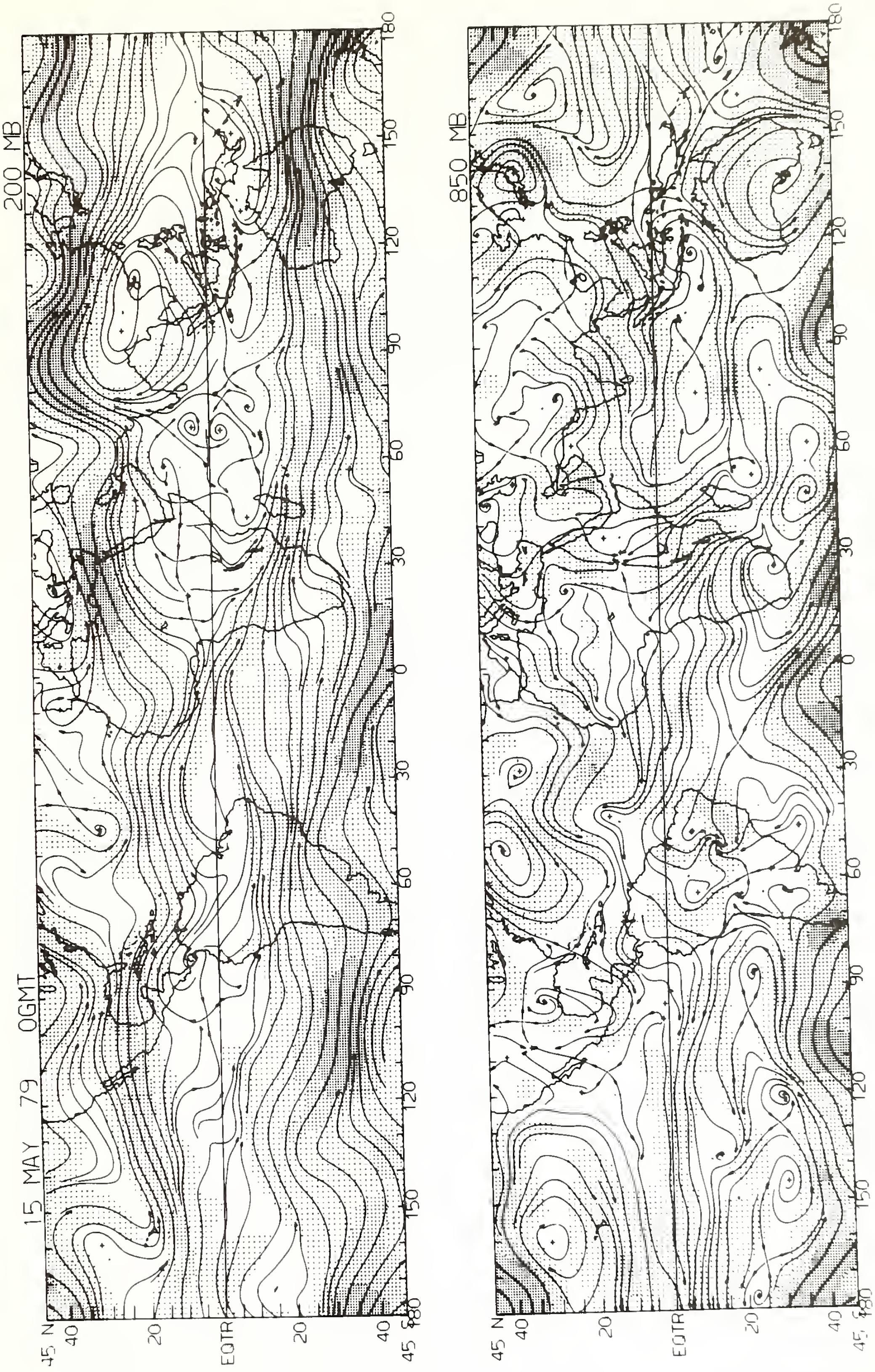
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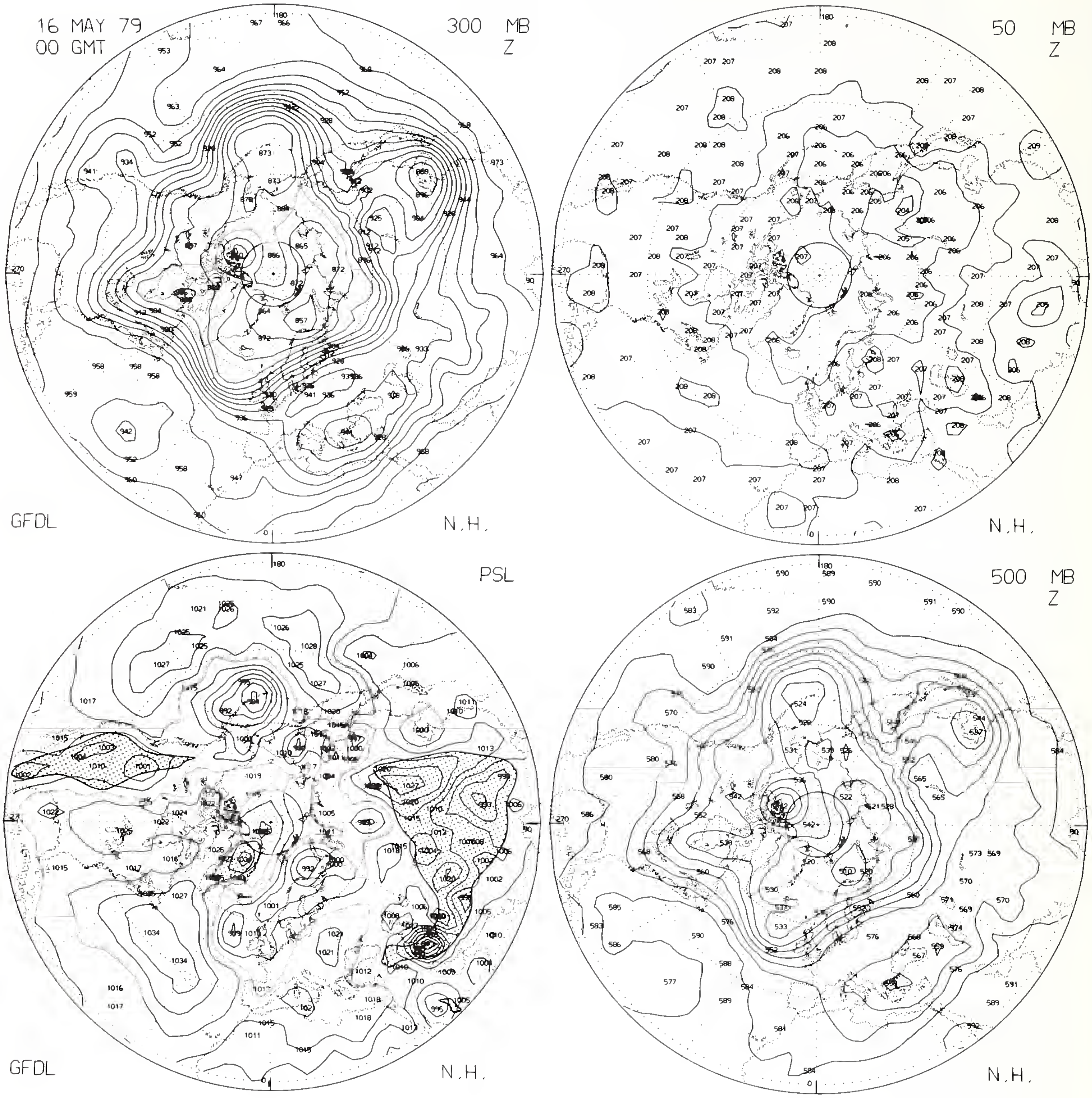
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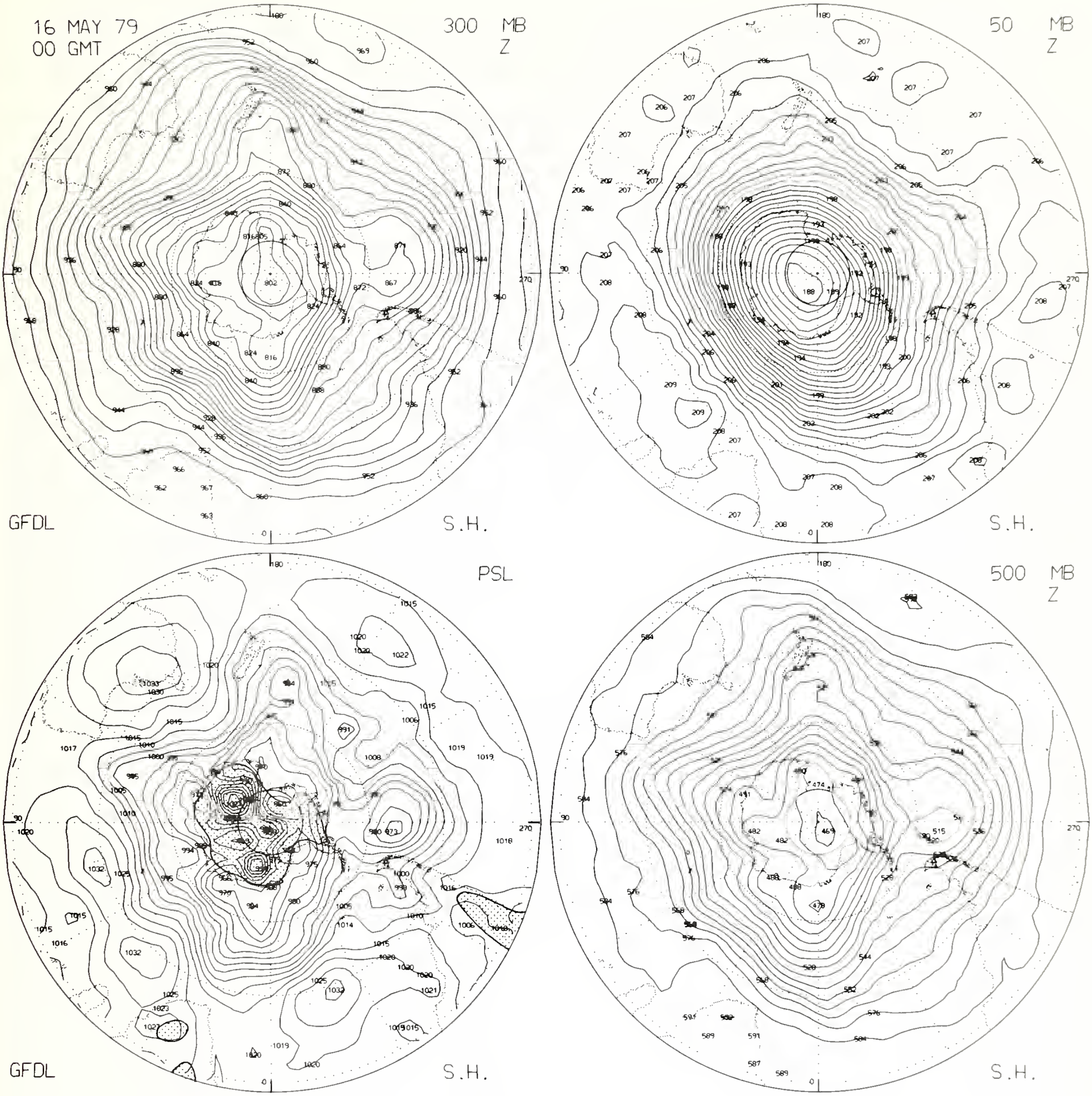16 MAY 79
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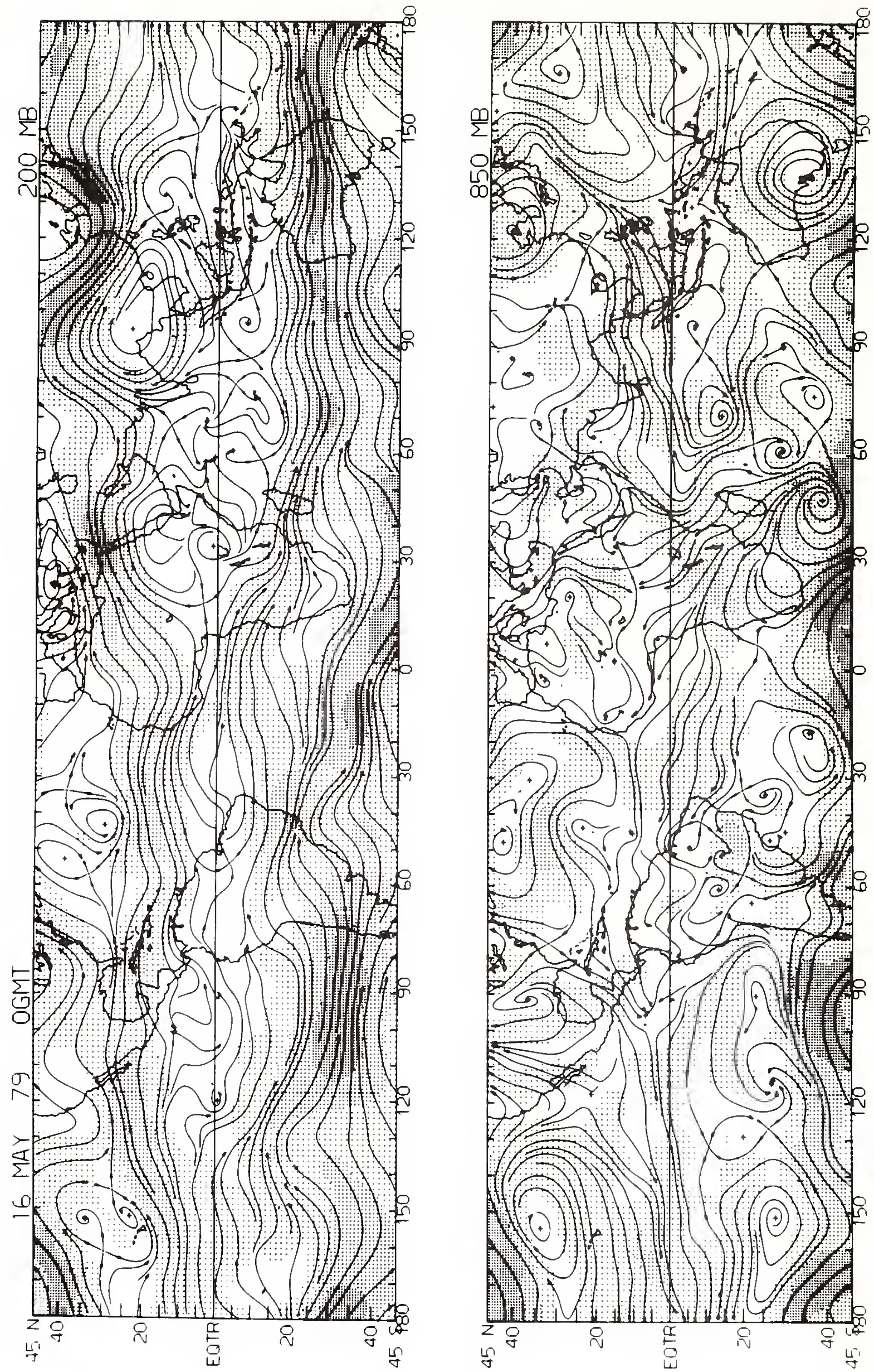
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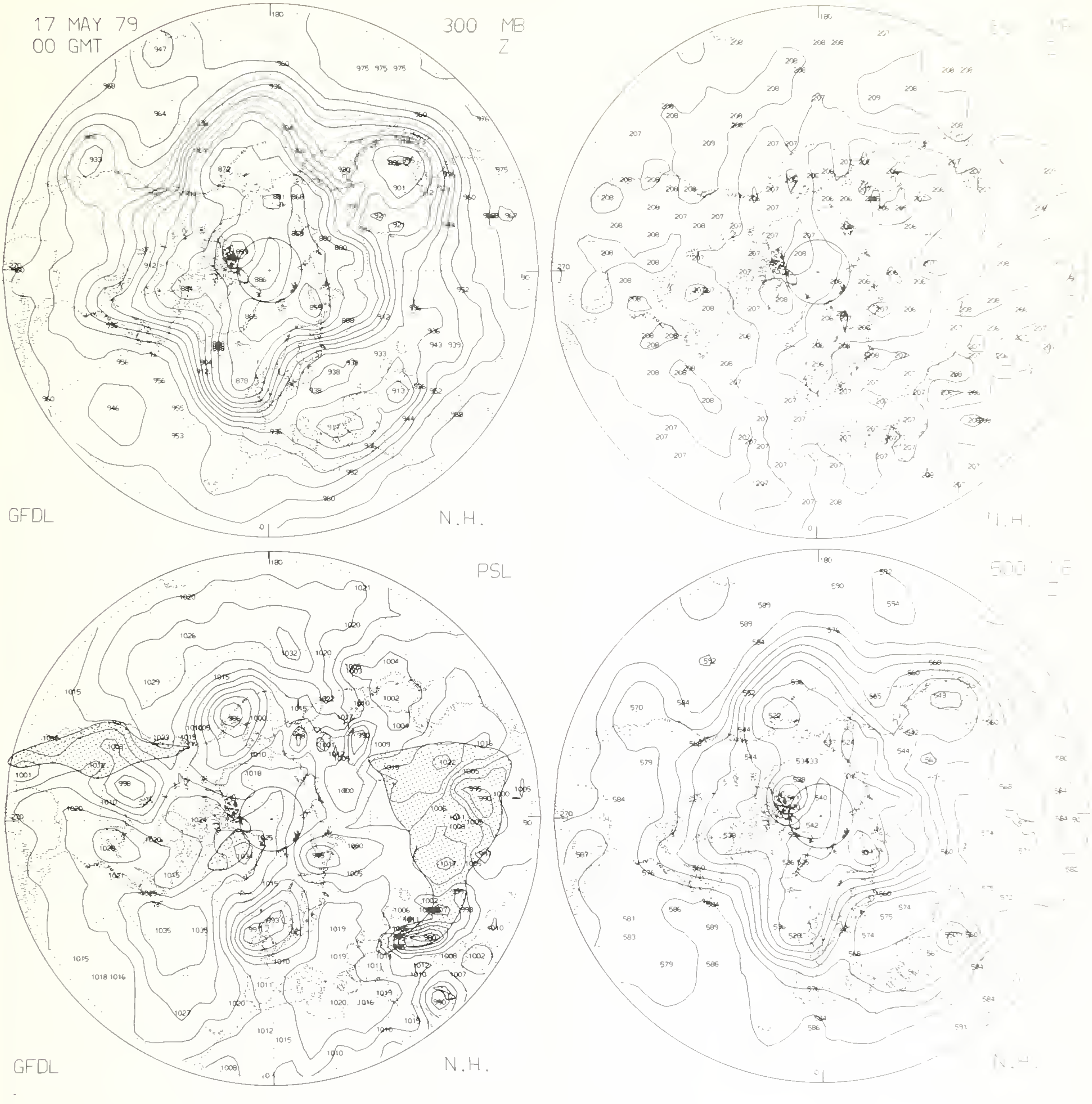
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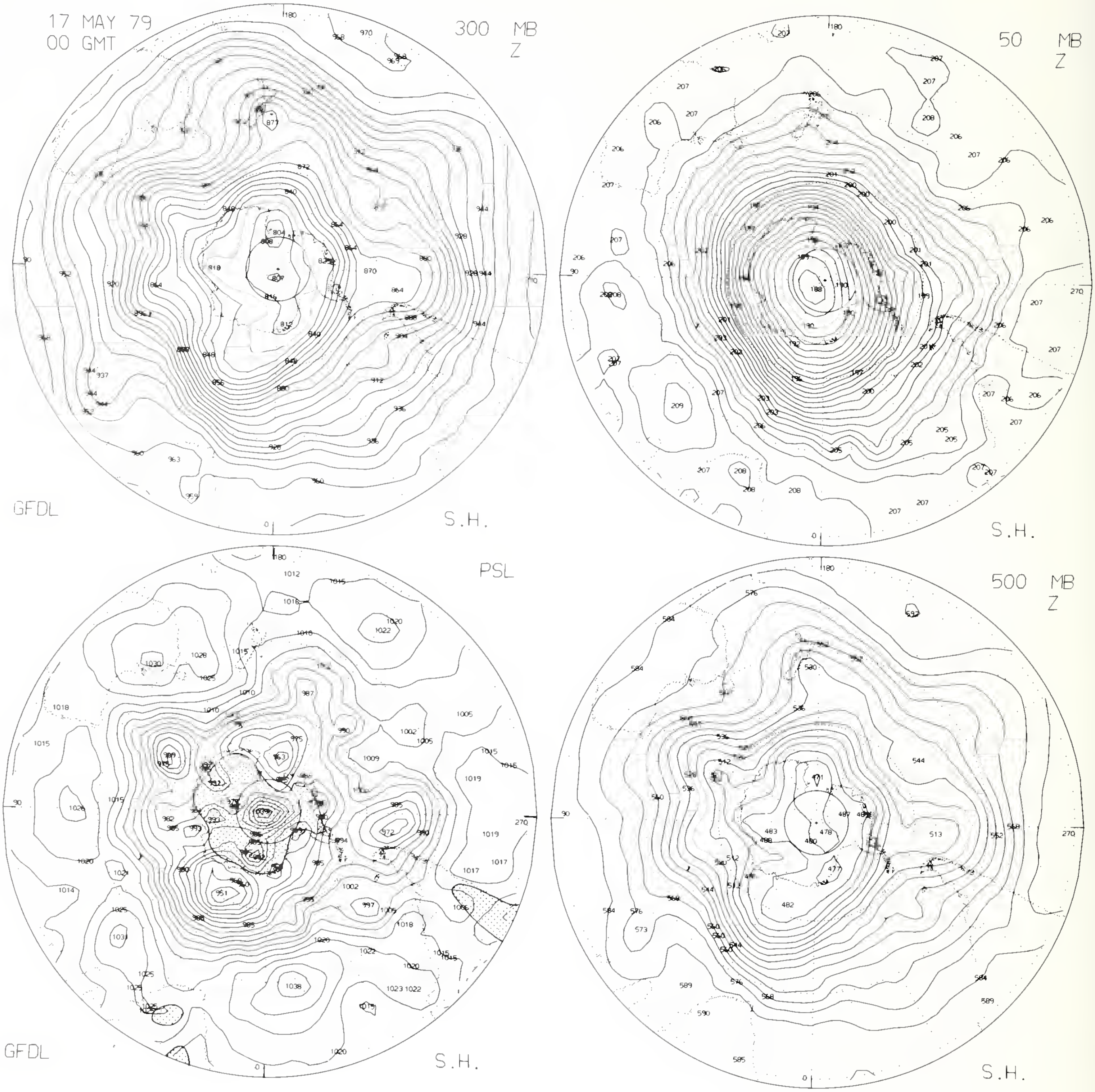
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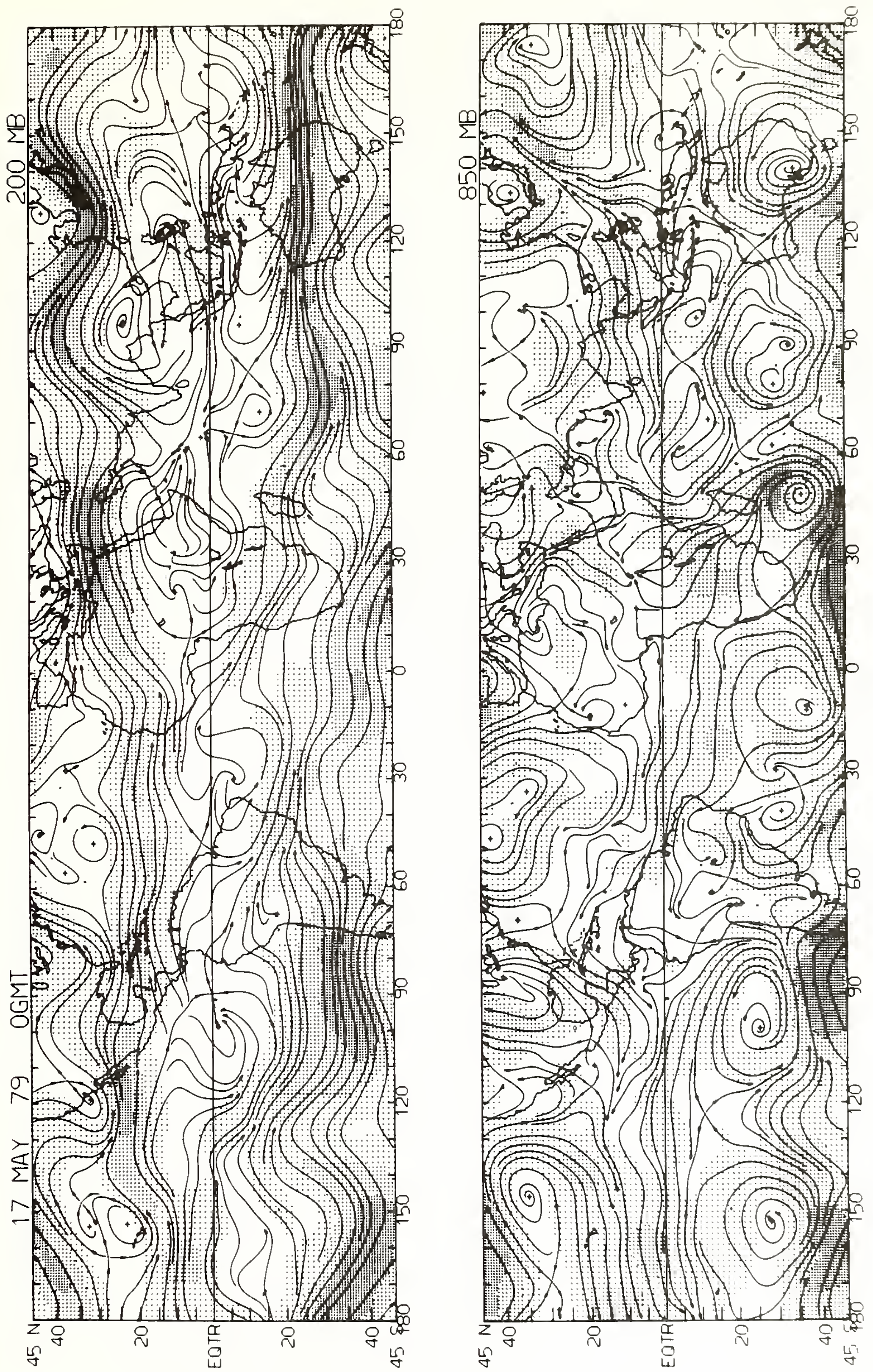
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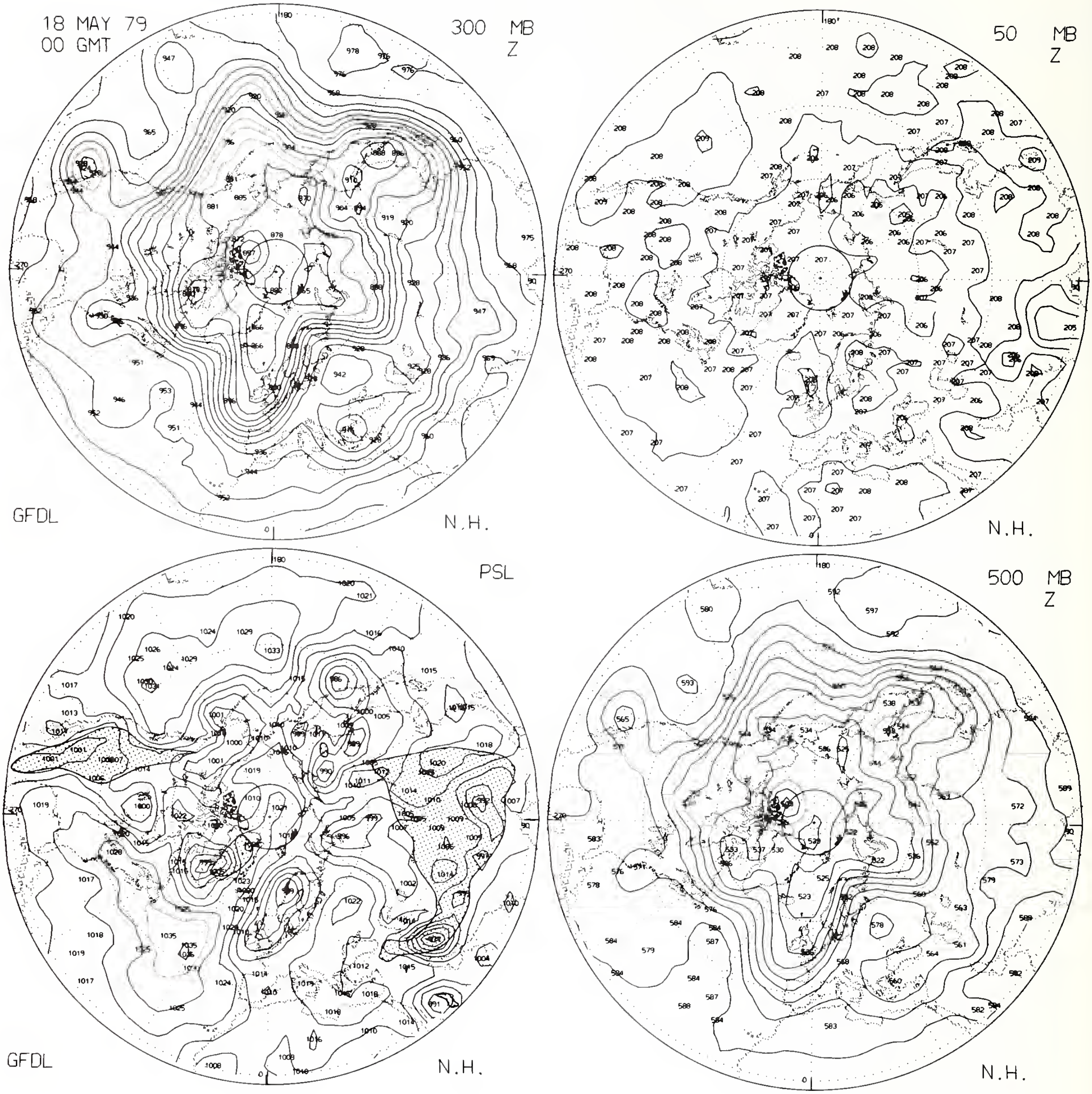
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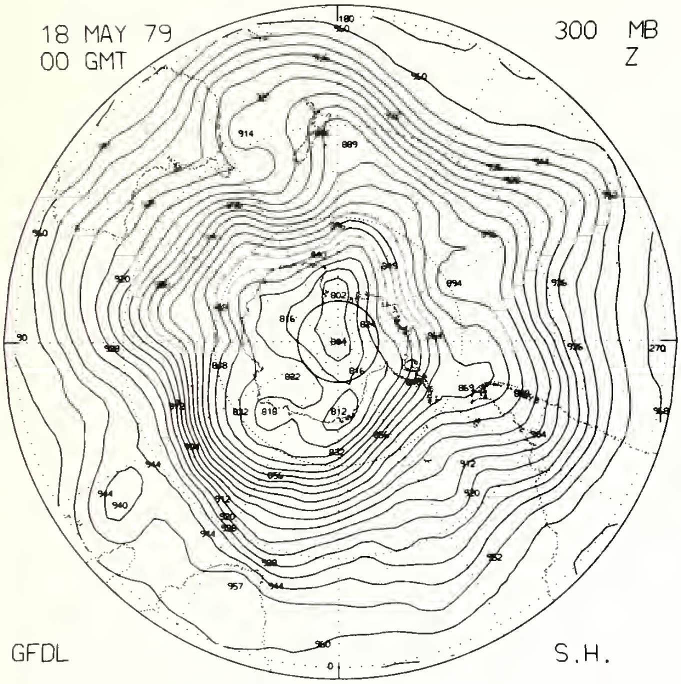
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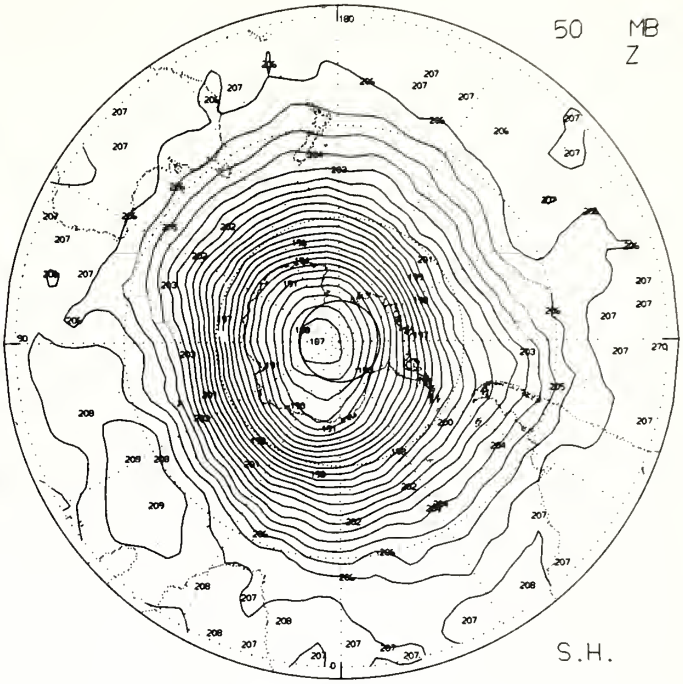
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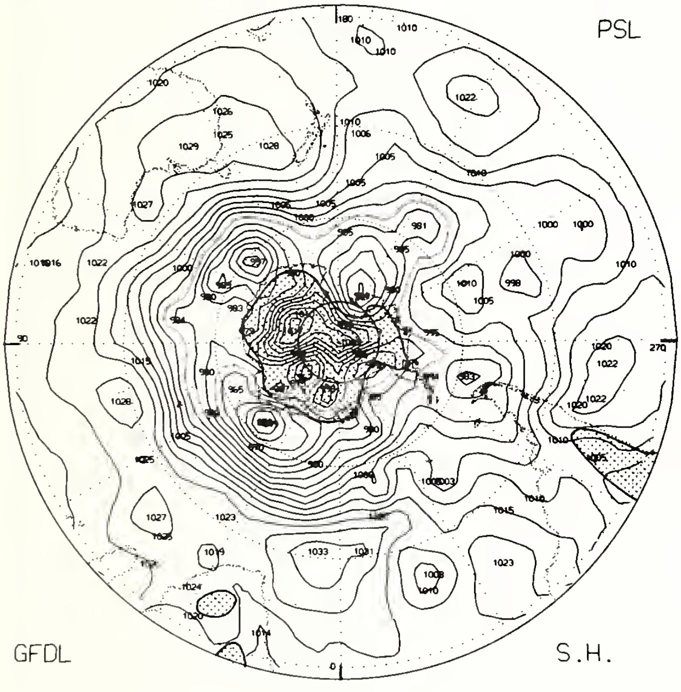
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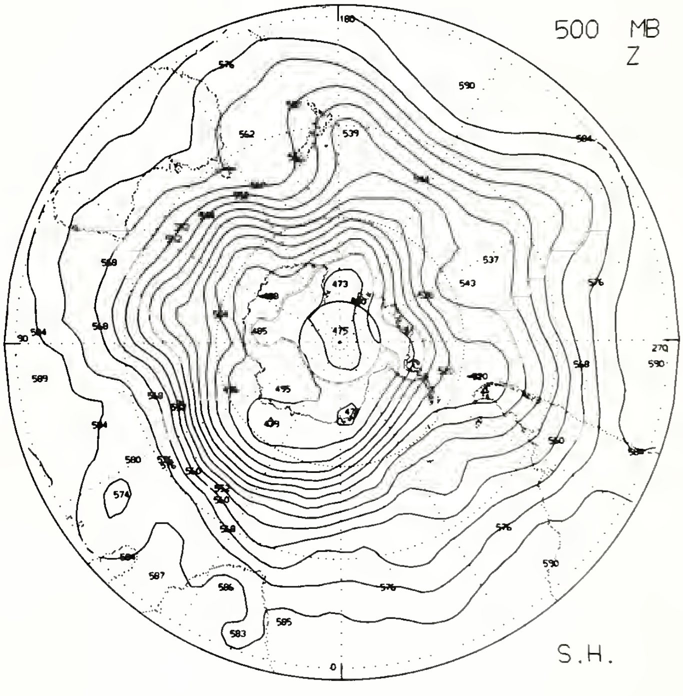
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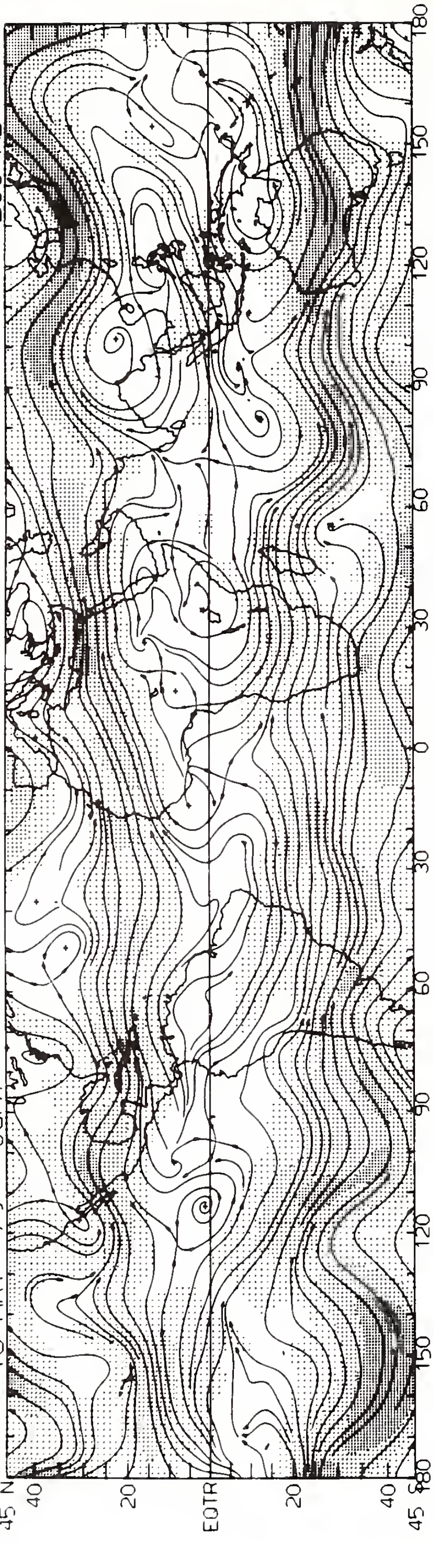

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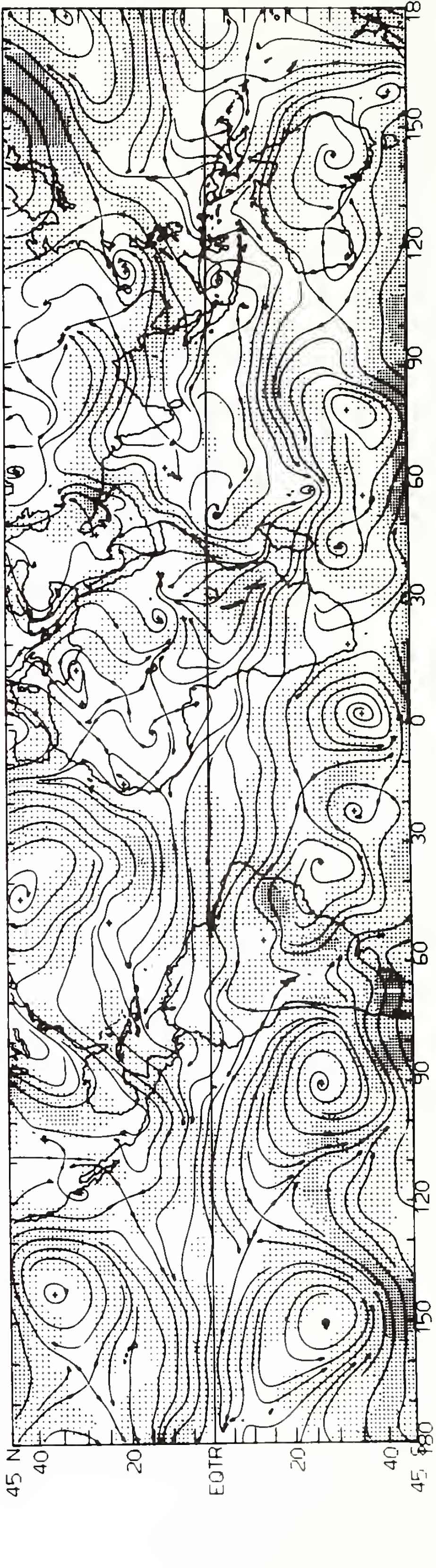

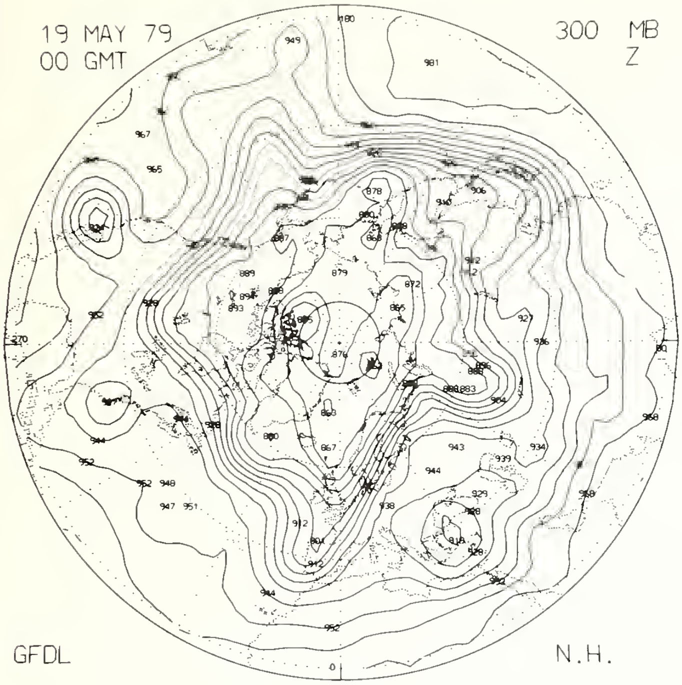
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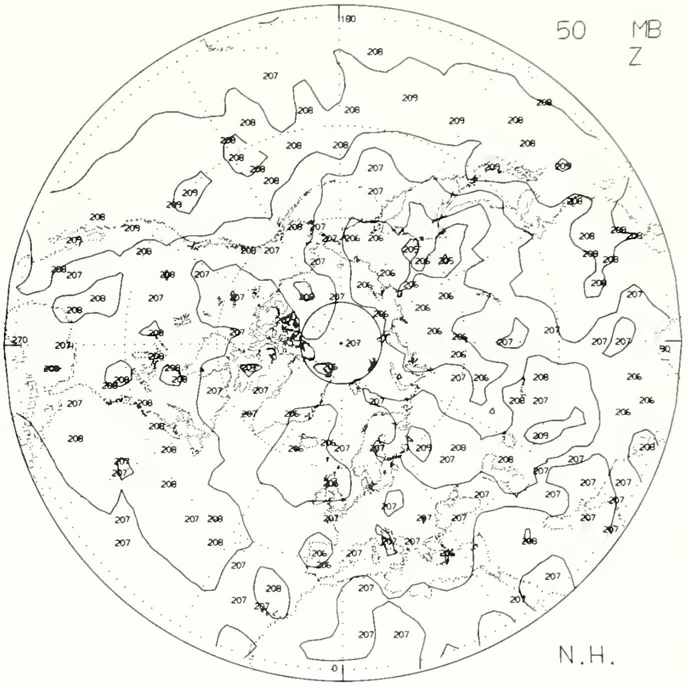
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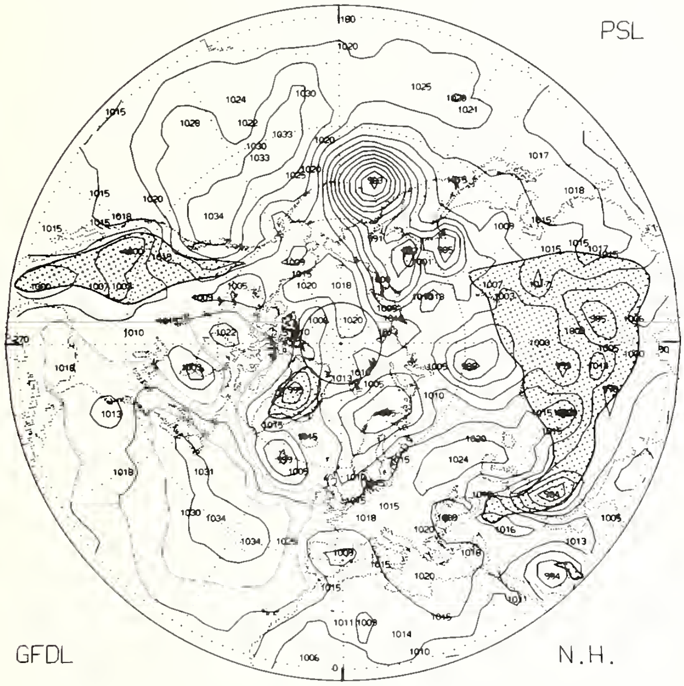
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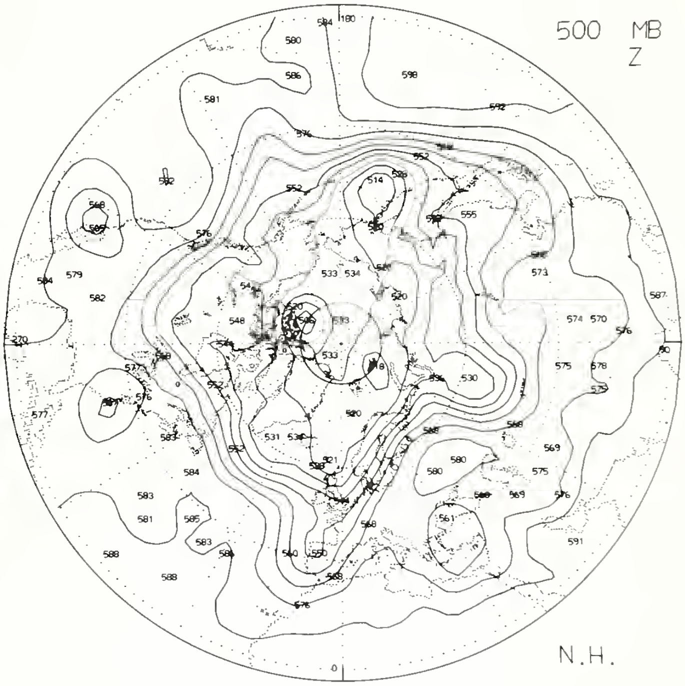
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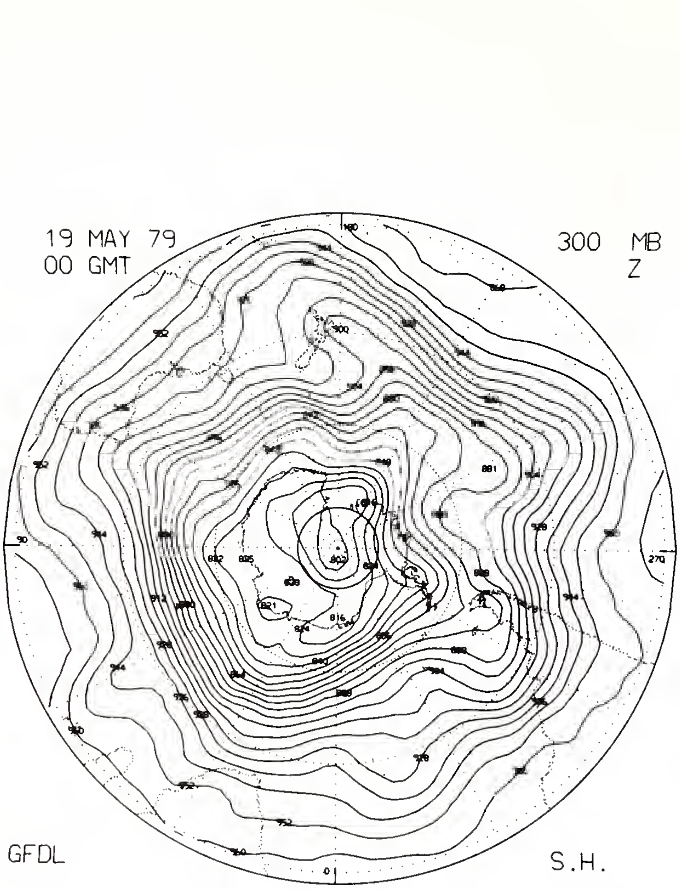
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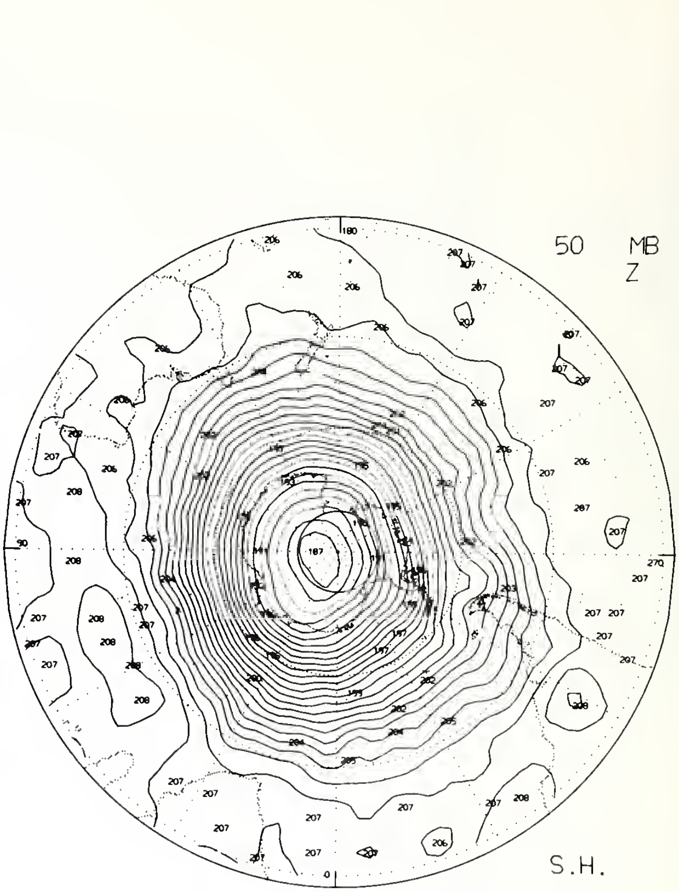
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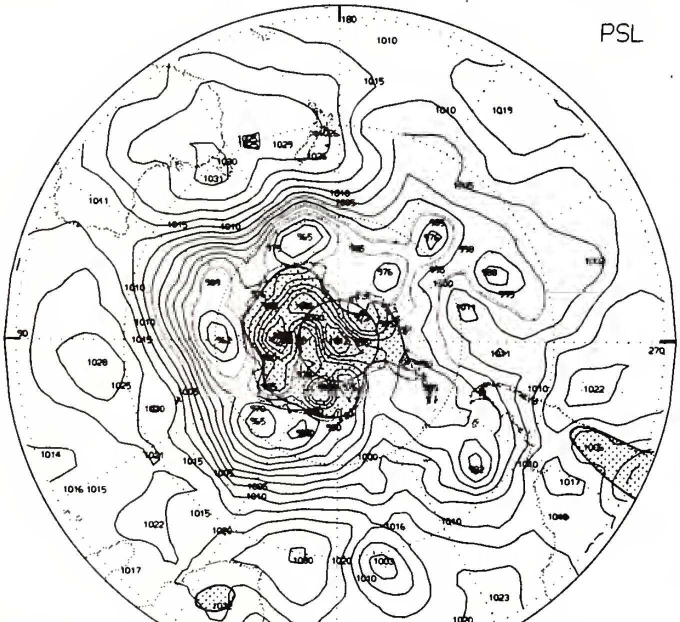
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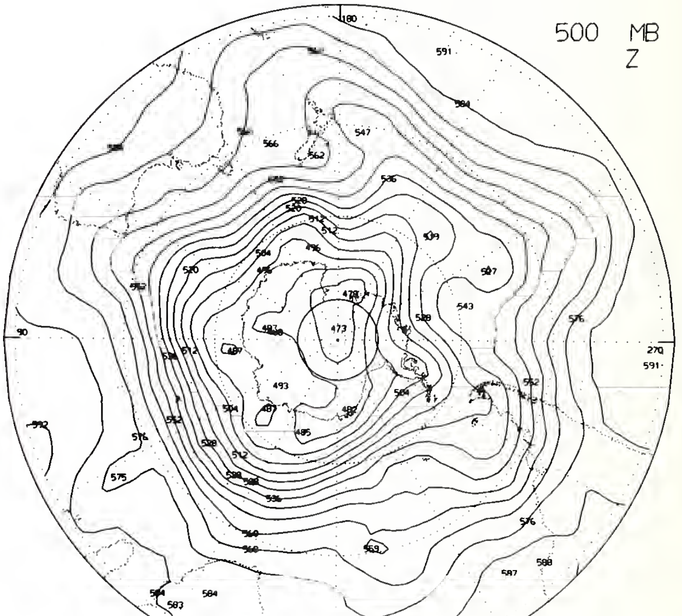
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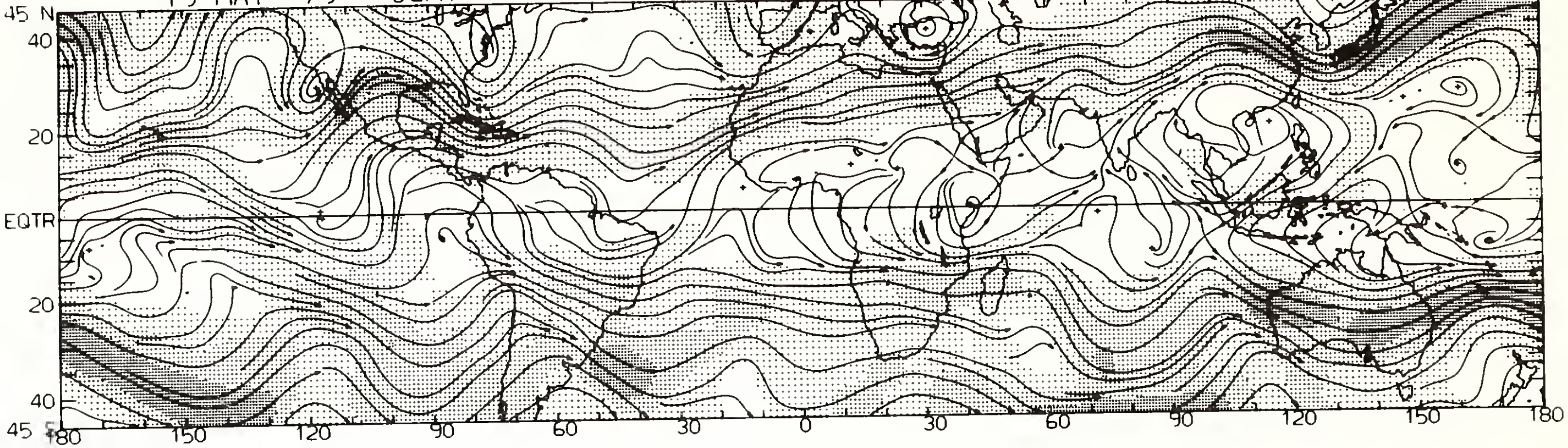

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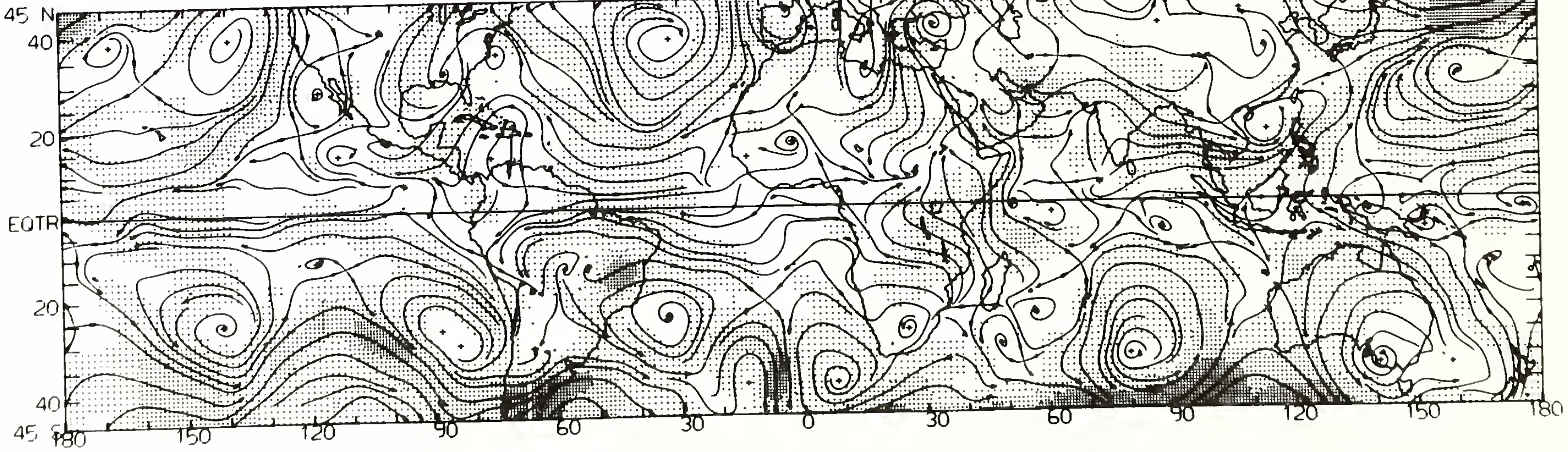

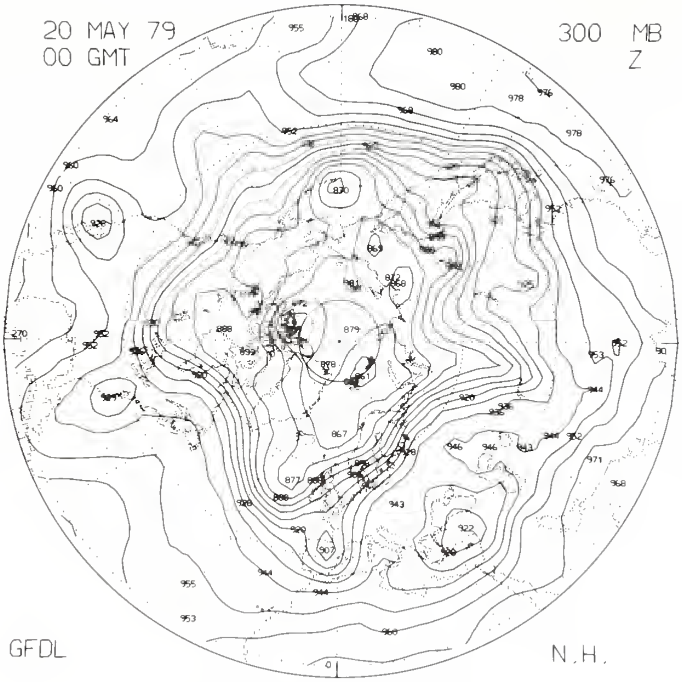
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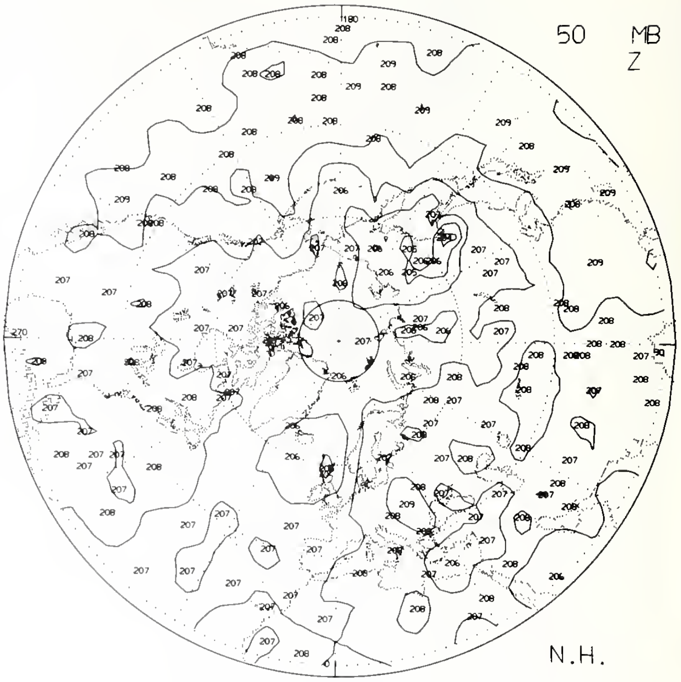
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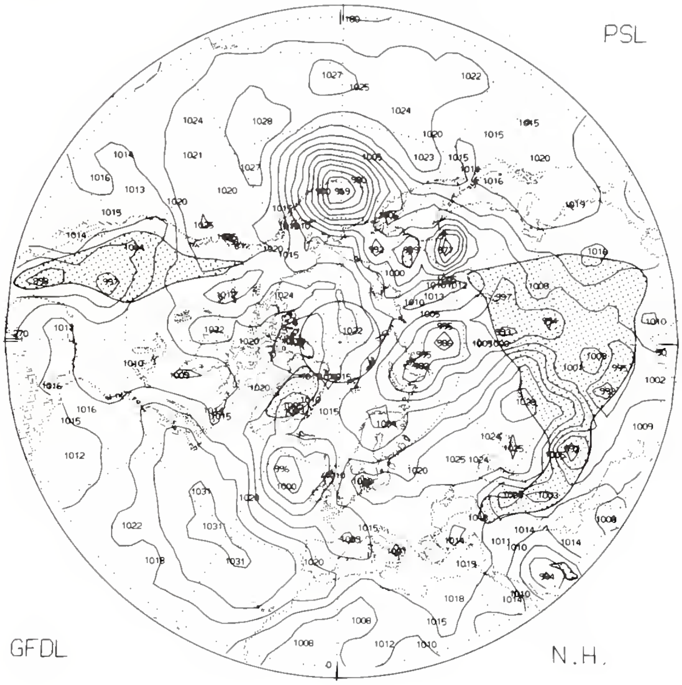
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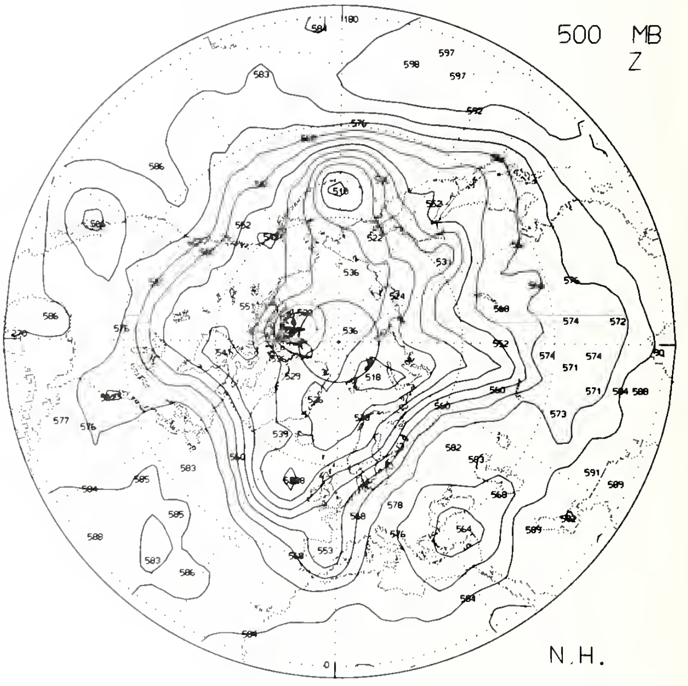
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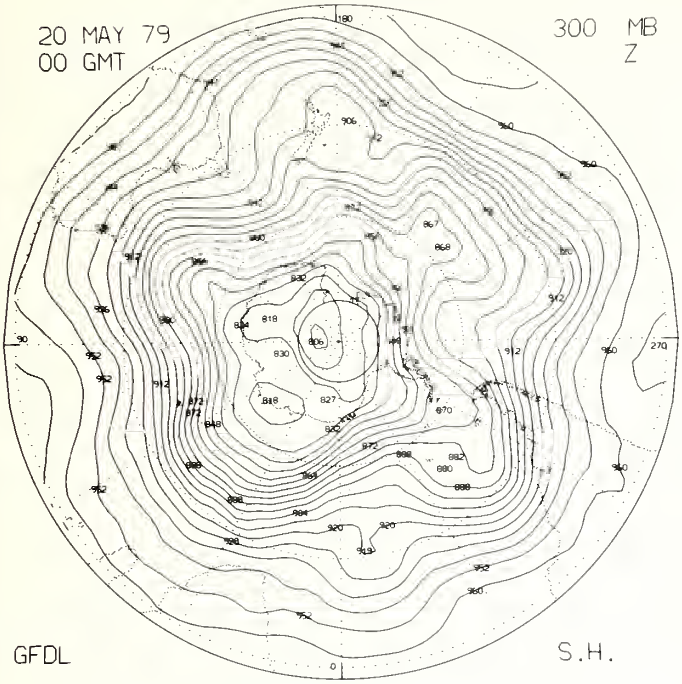
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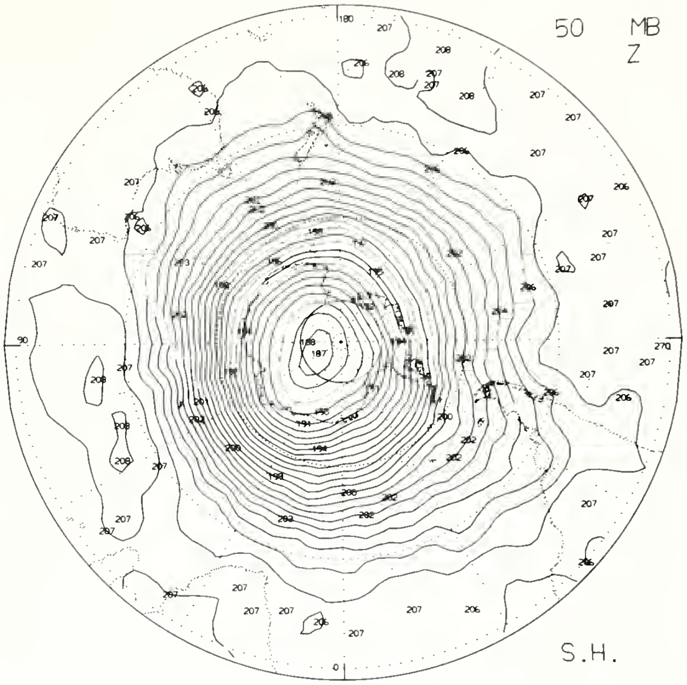
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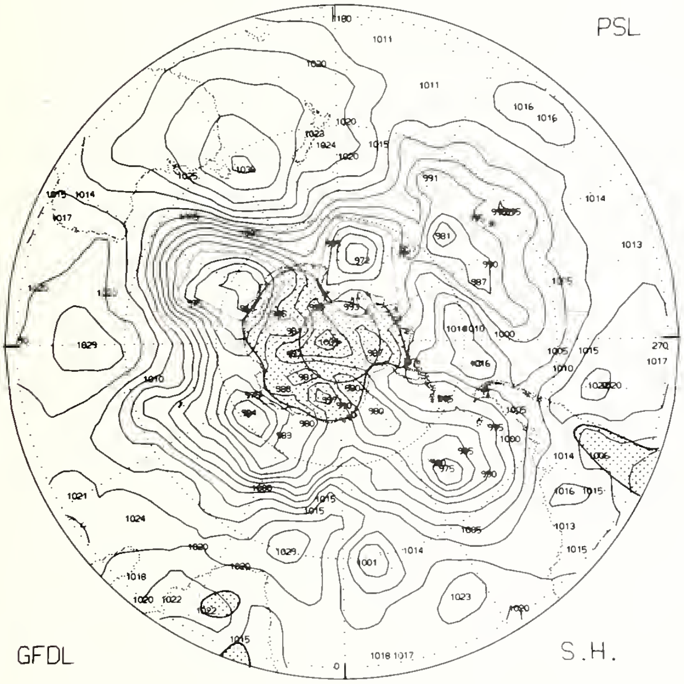
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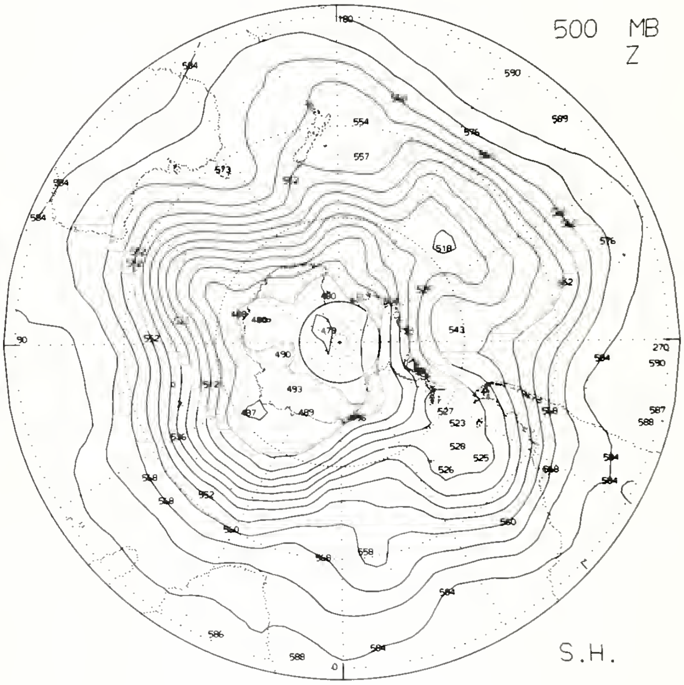
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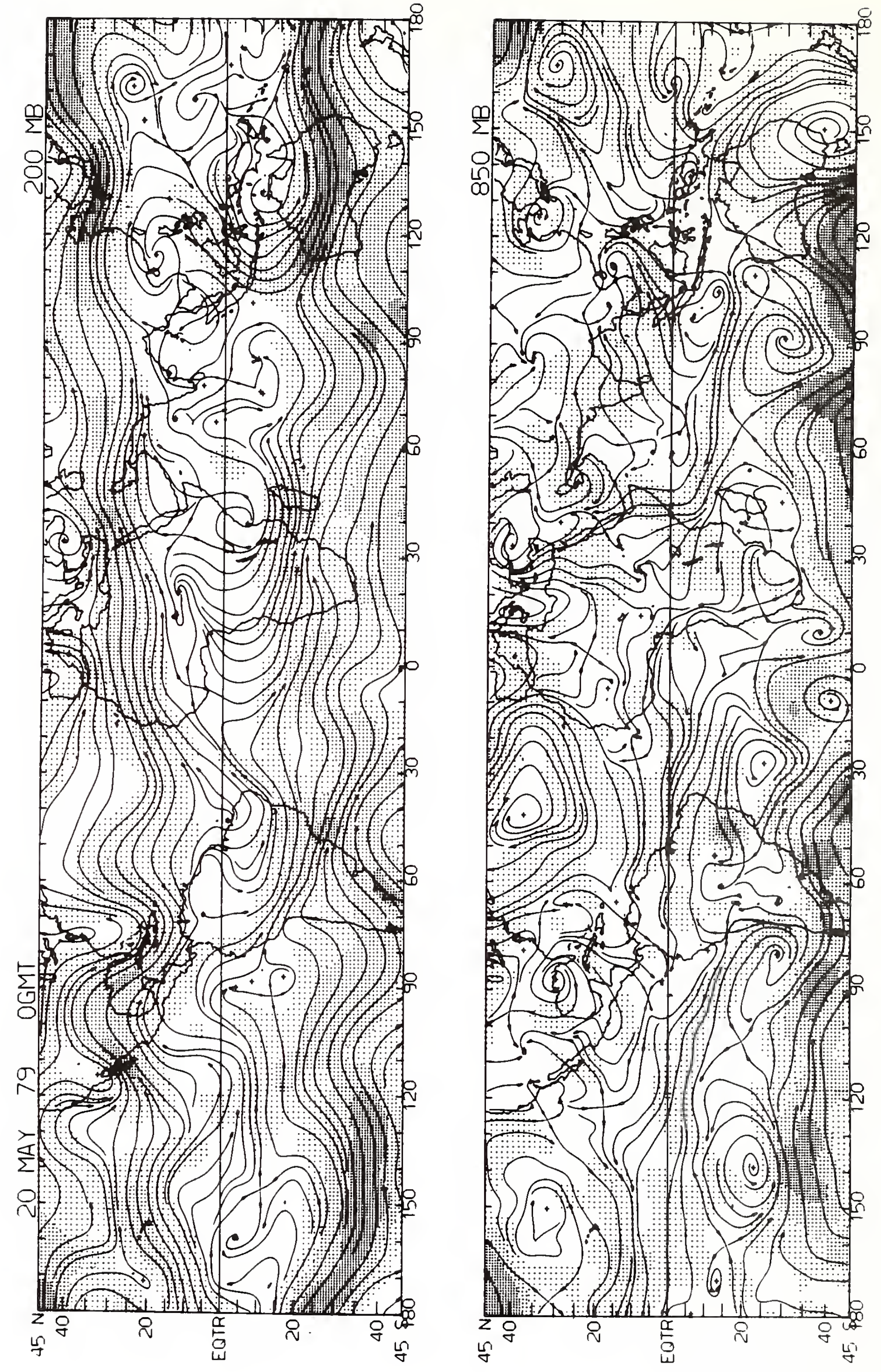
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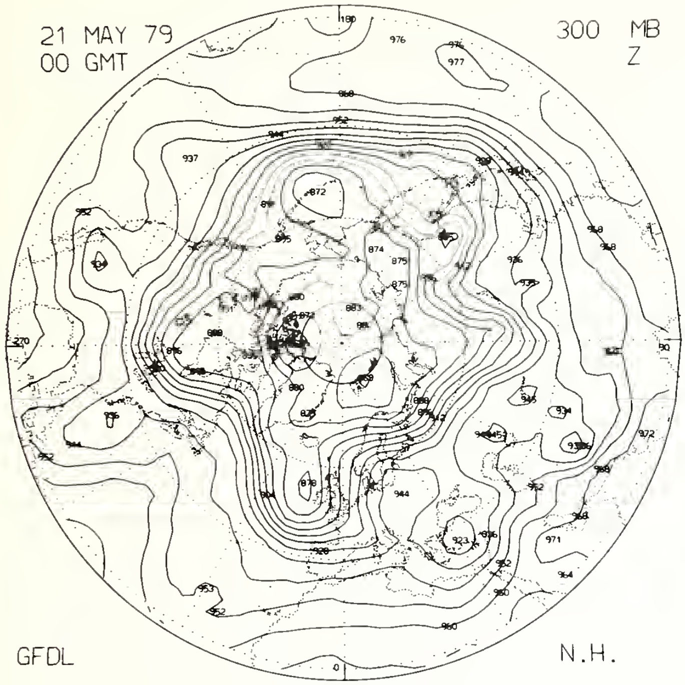
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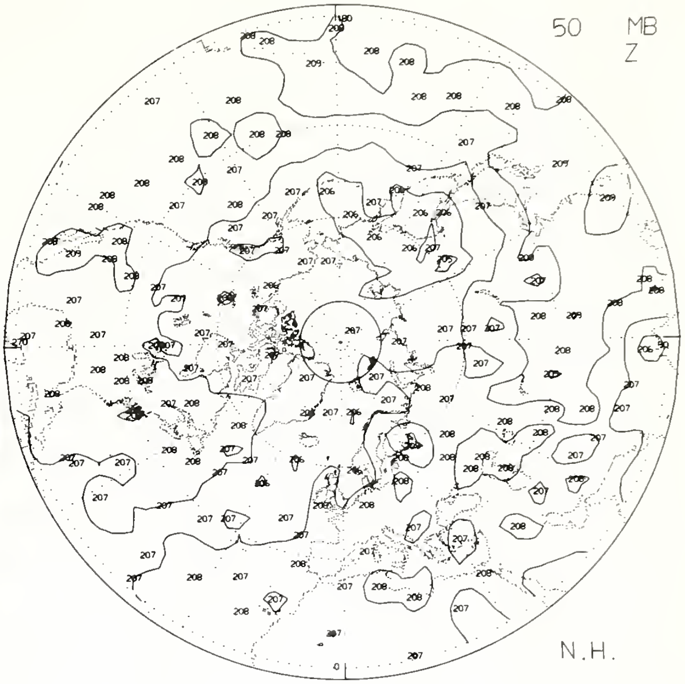
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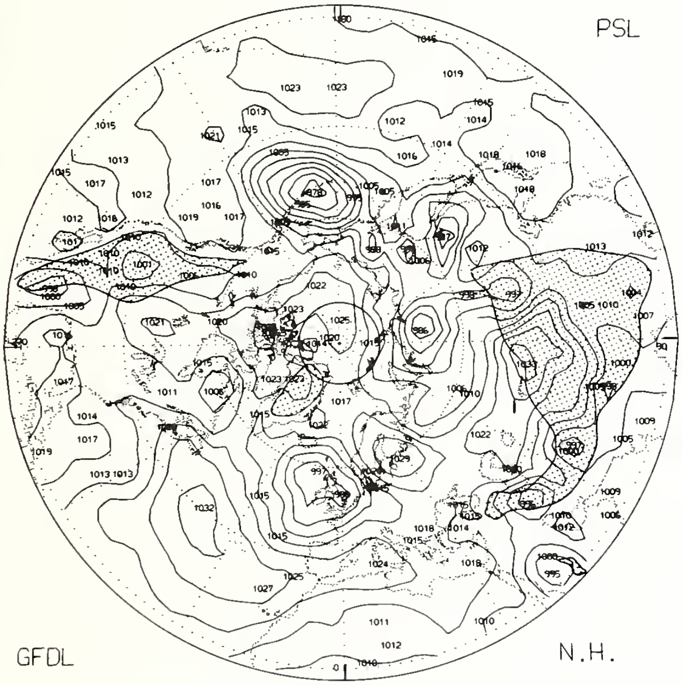
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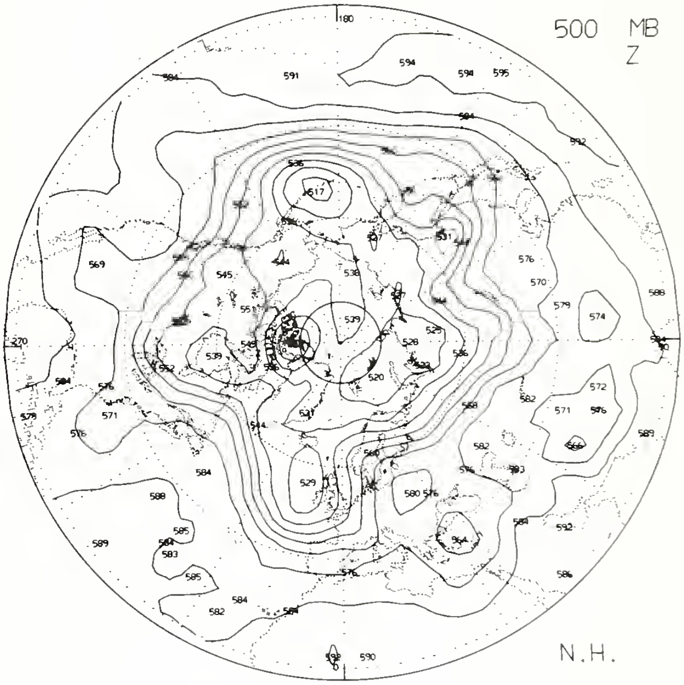
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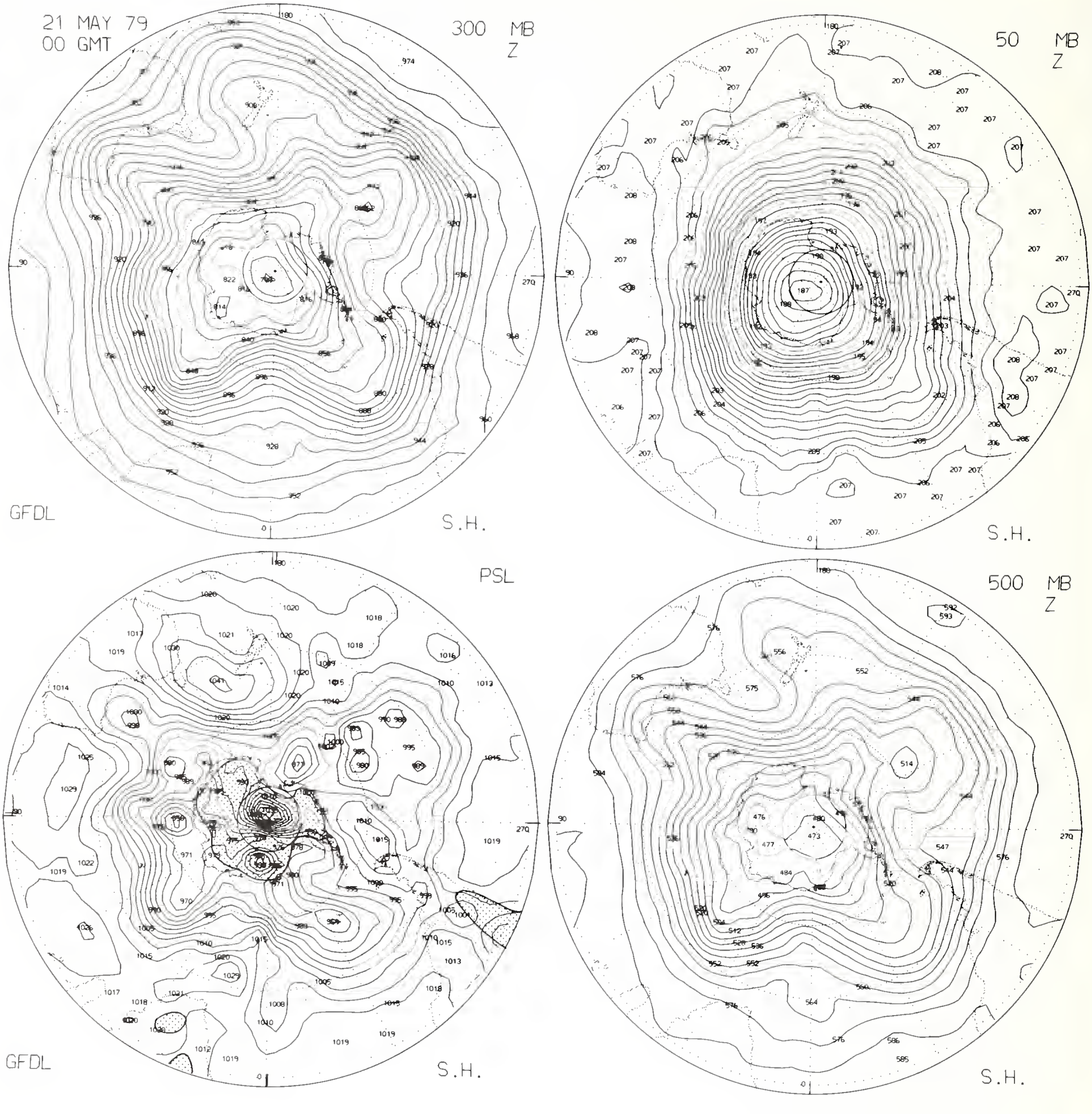
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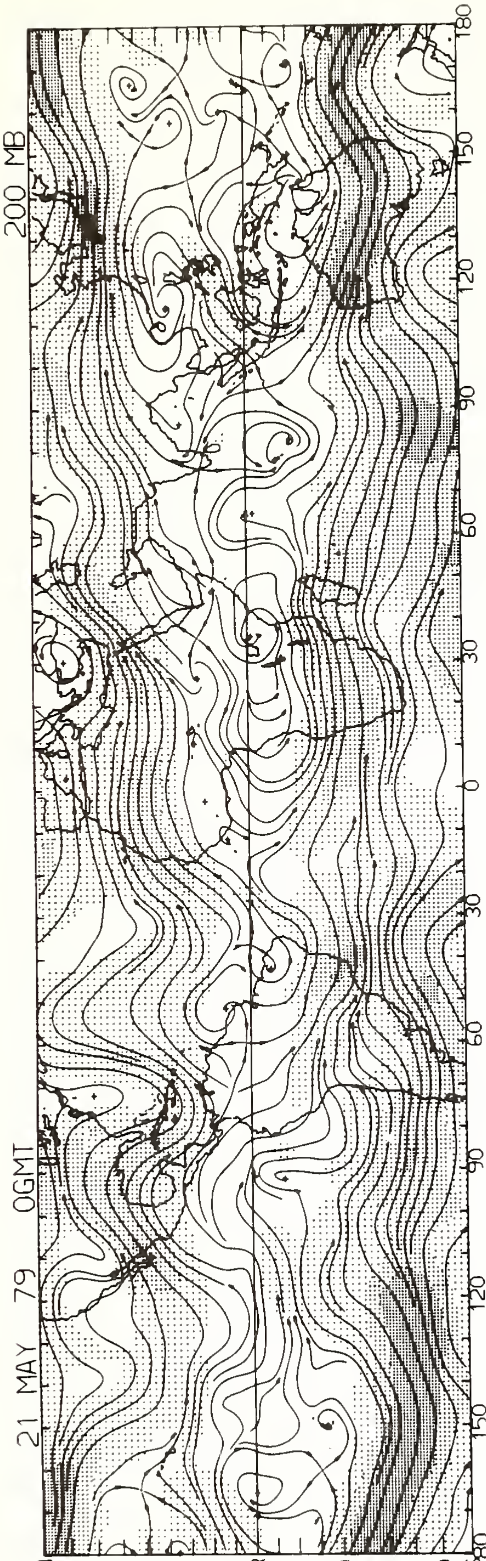

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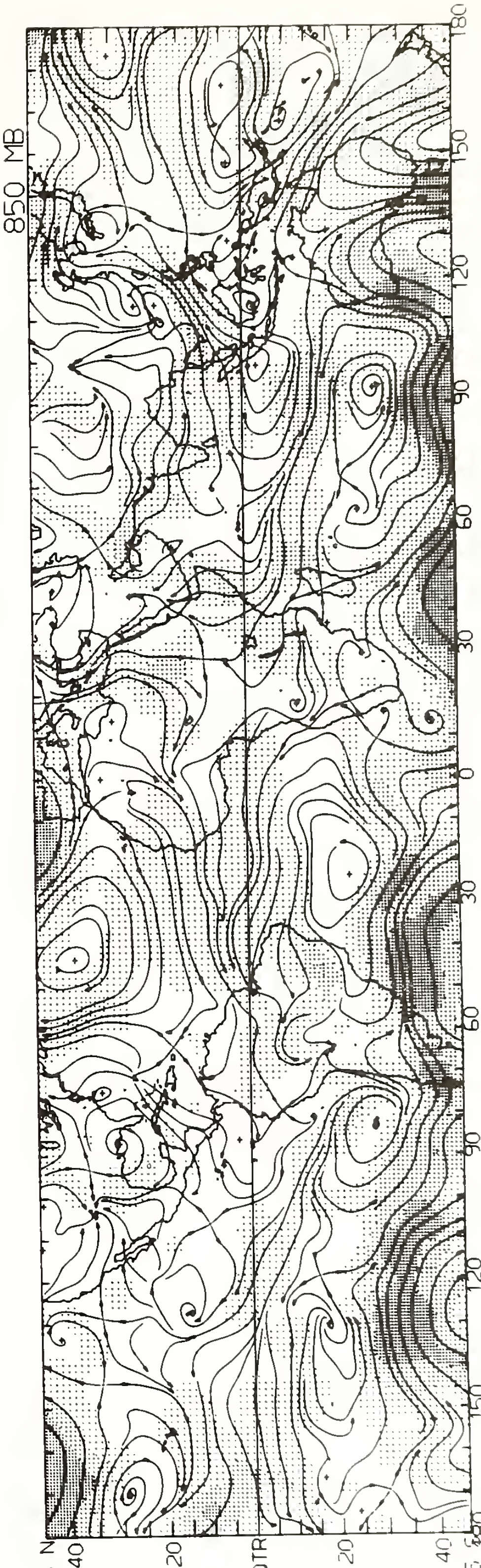

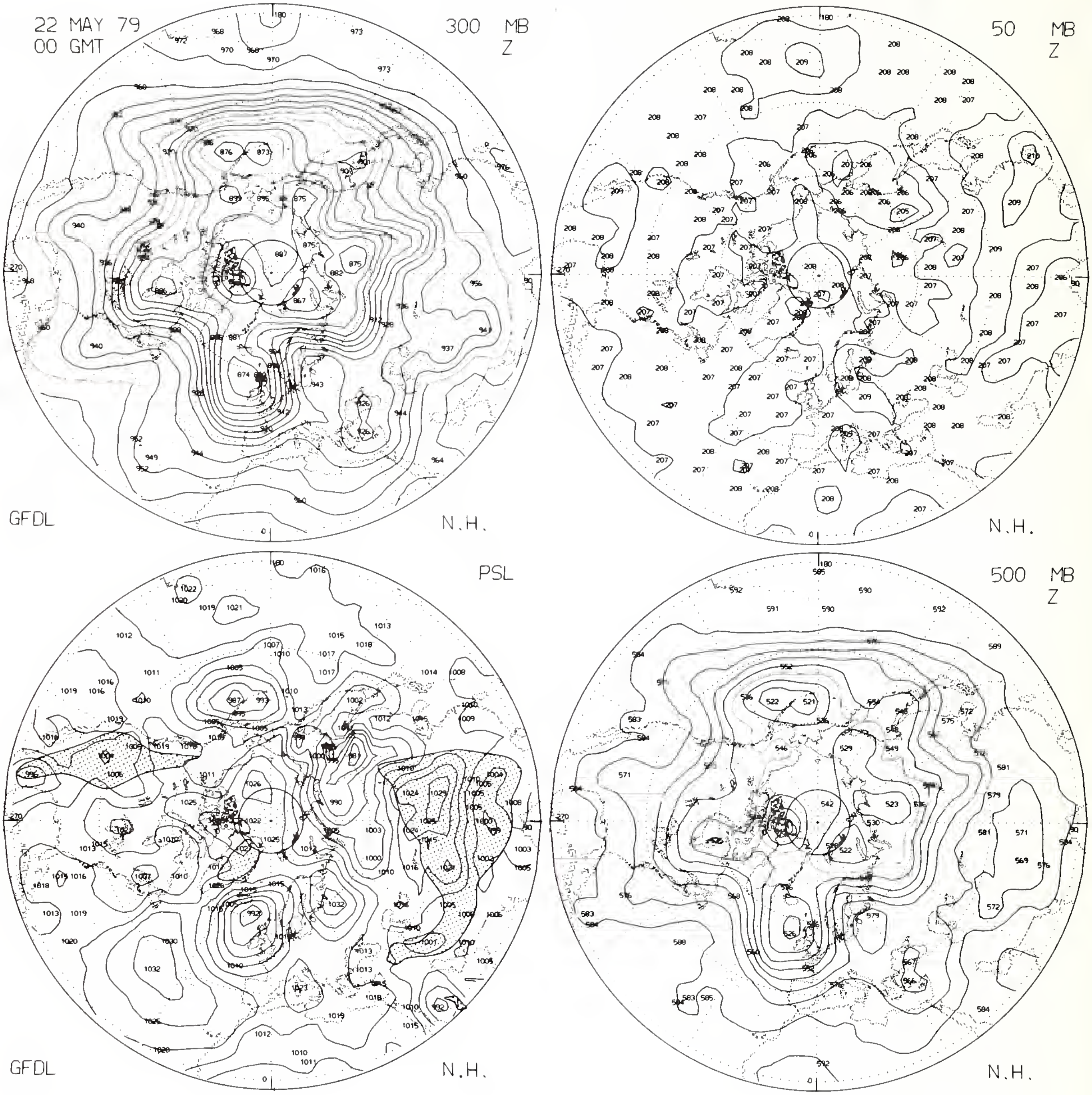
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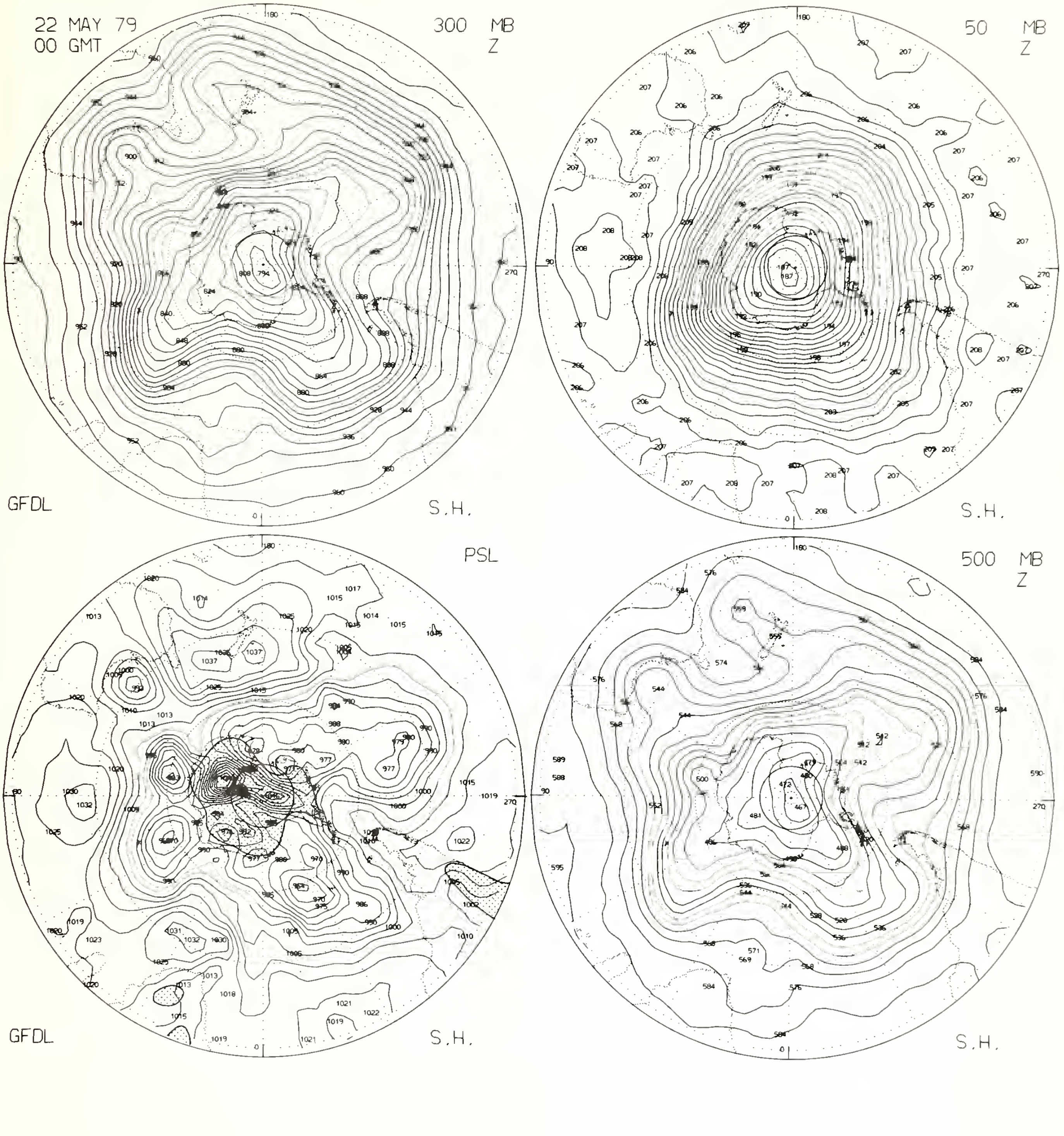
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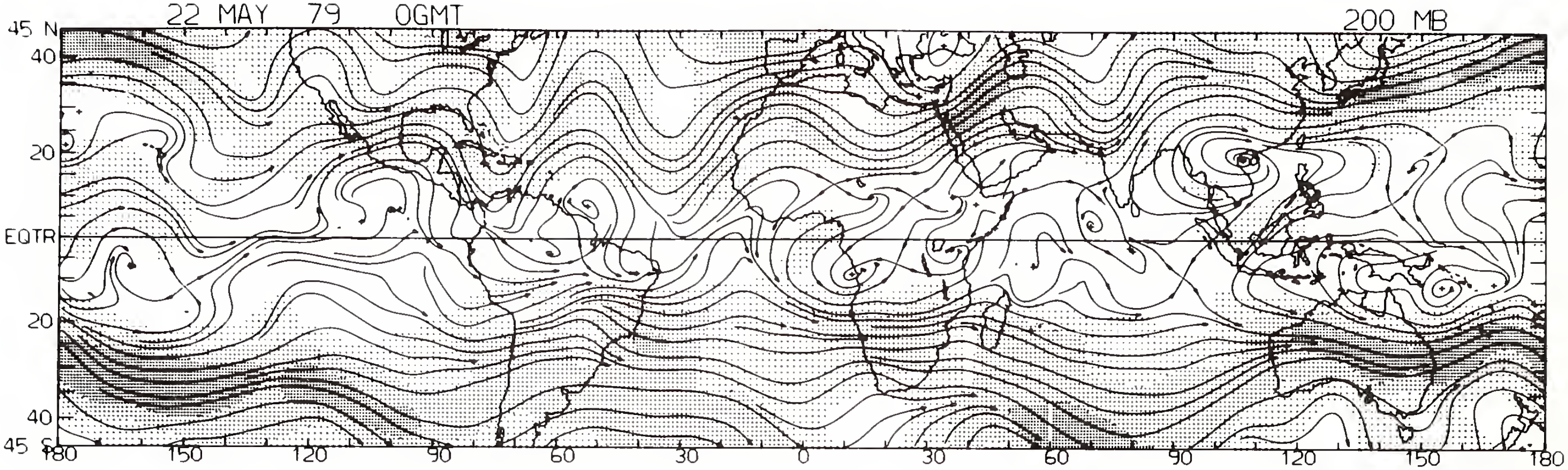

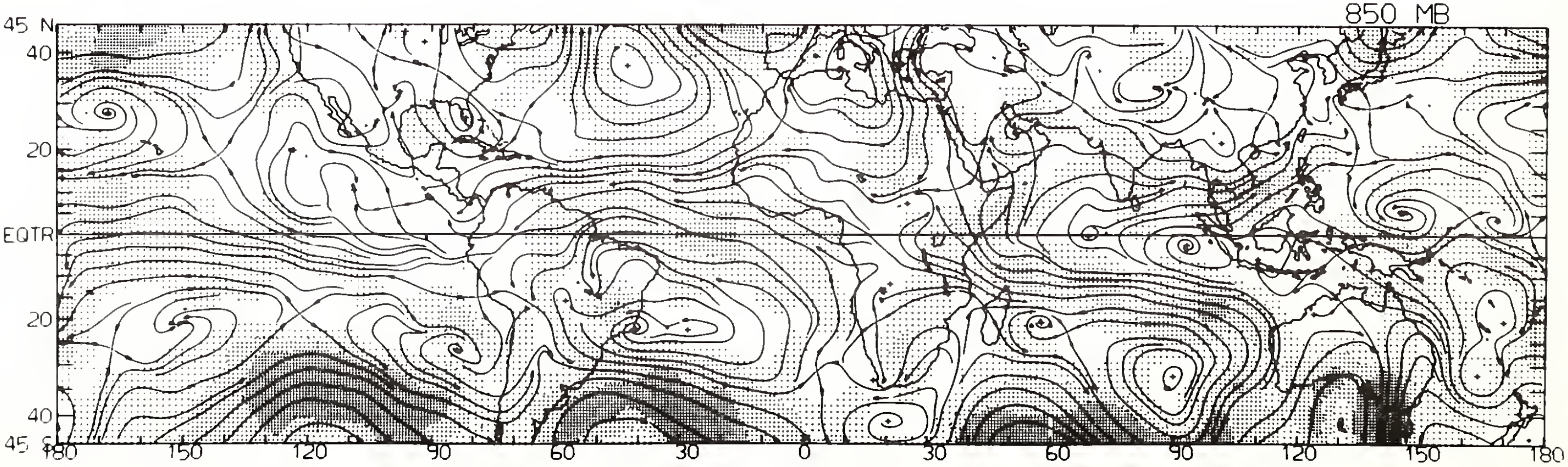

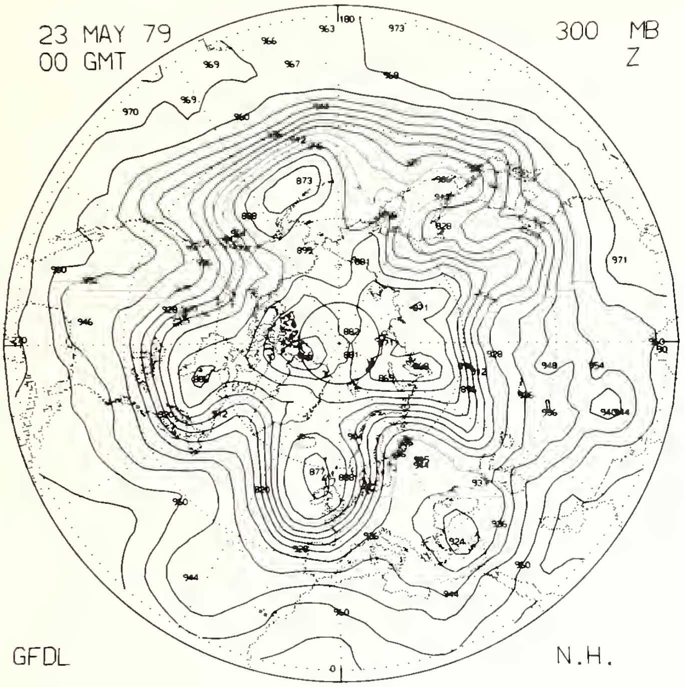
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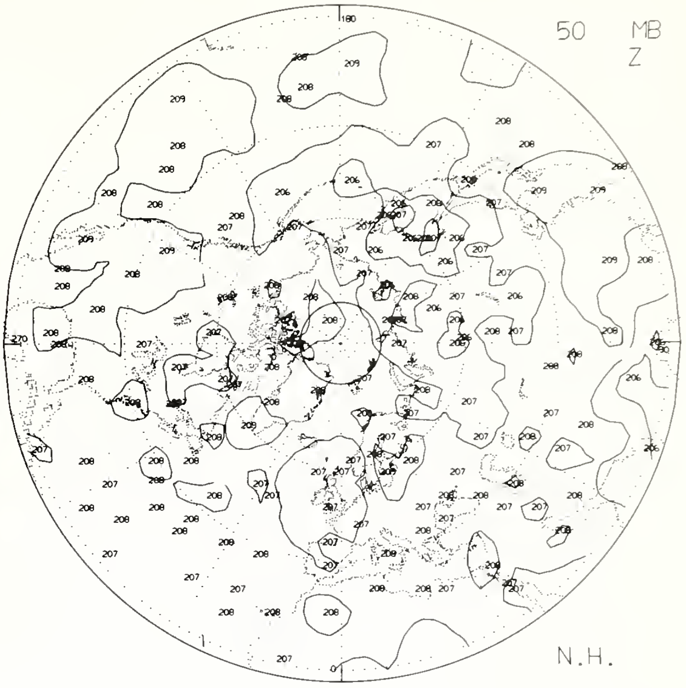
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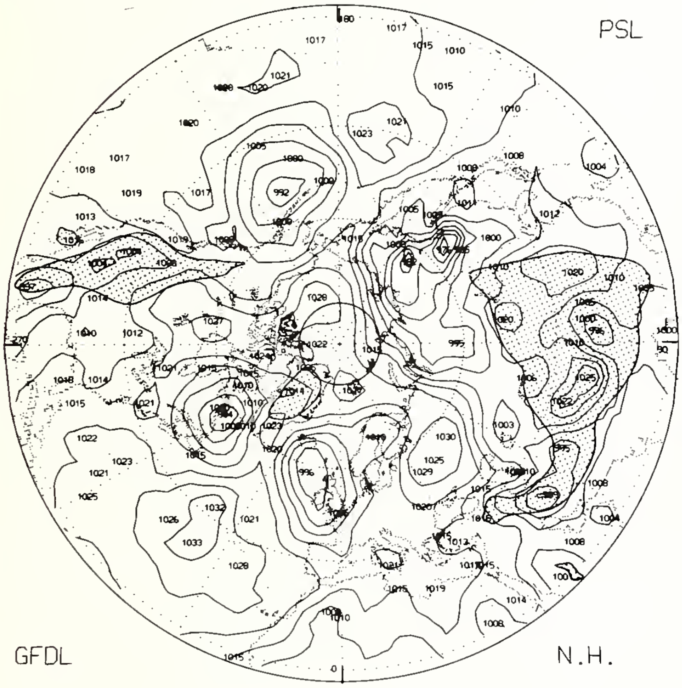
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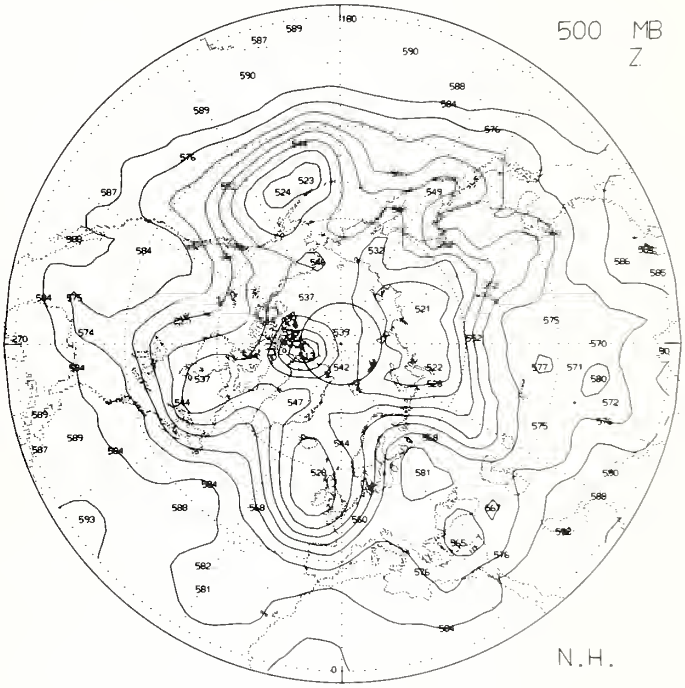
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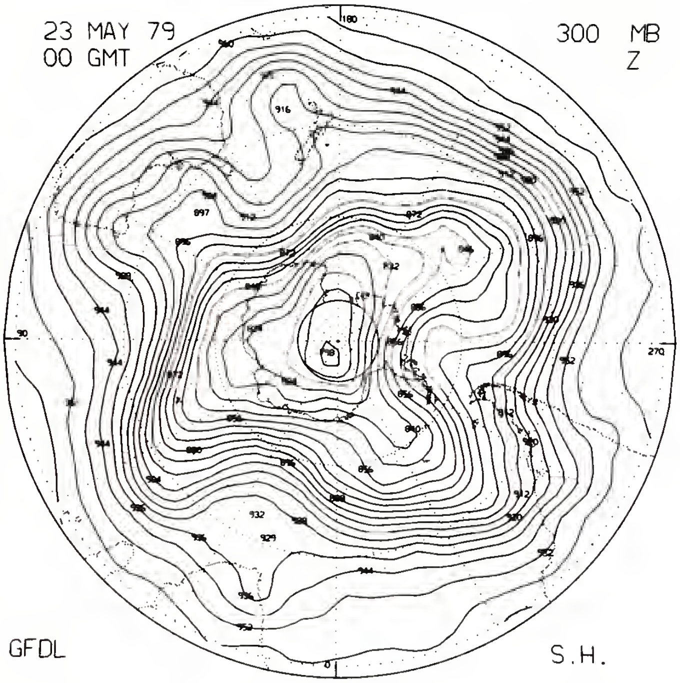
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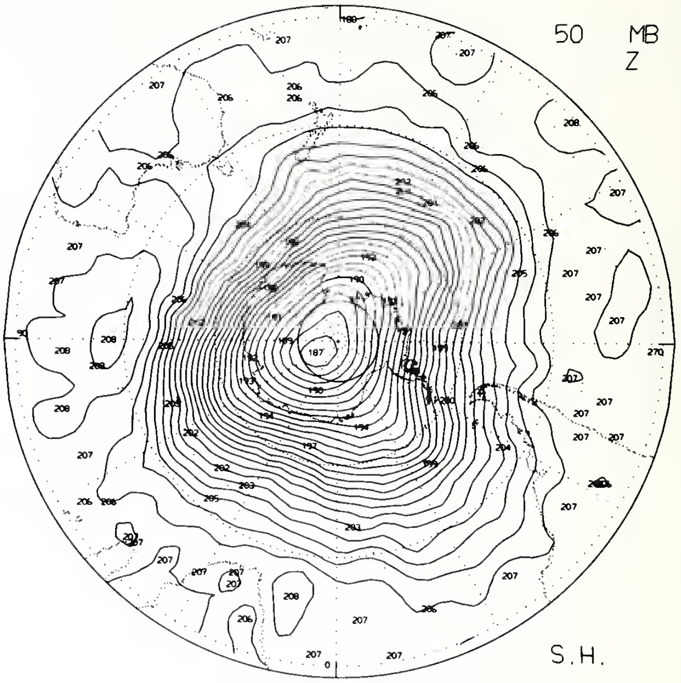
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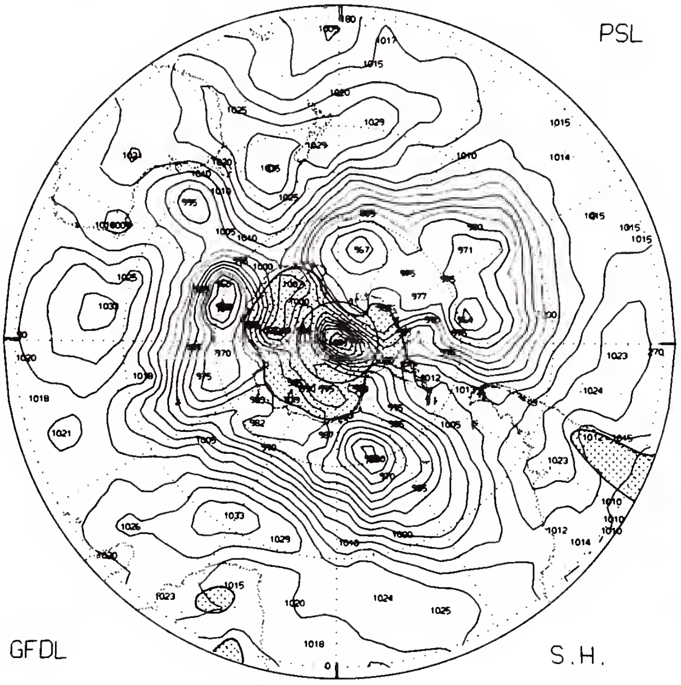
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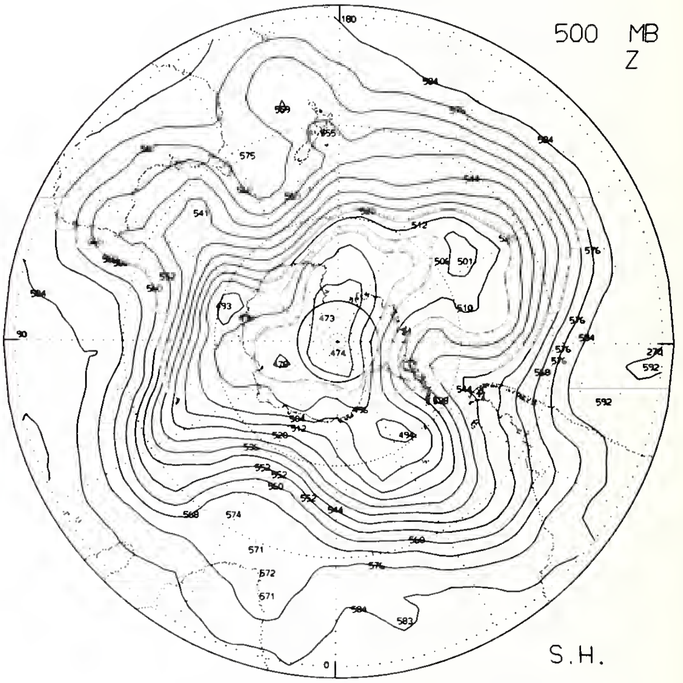
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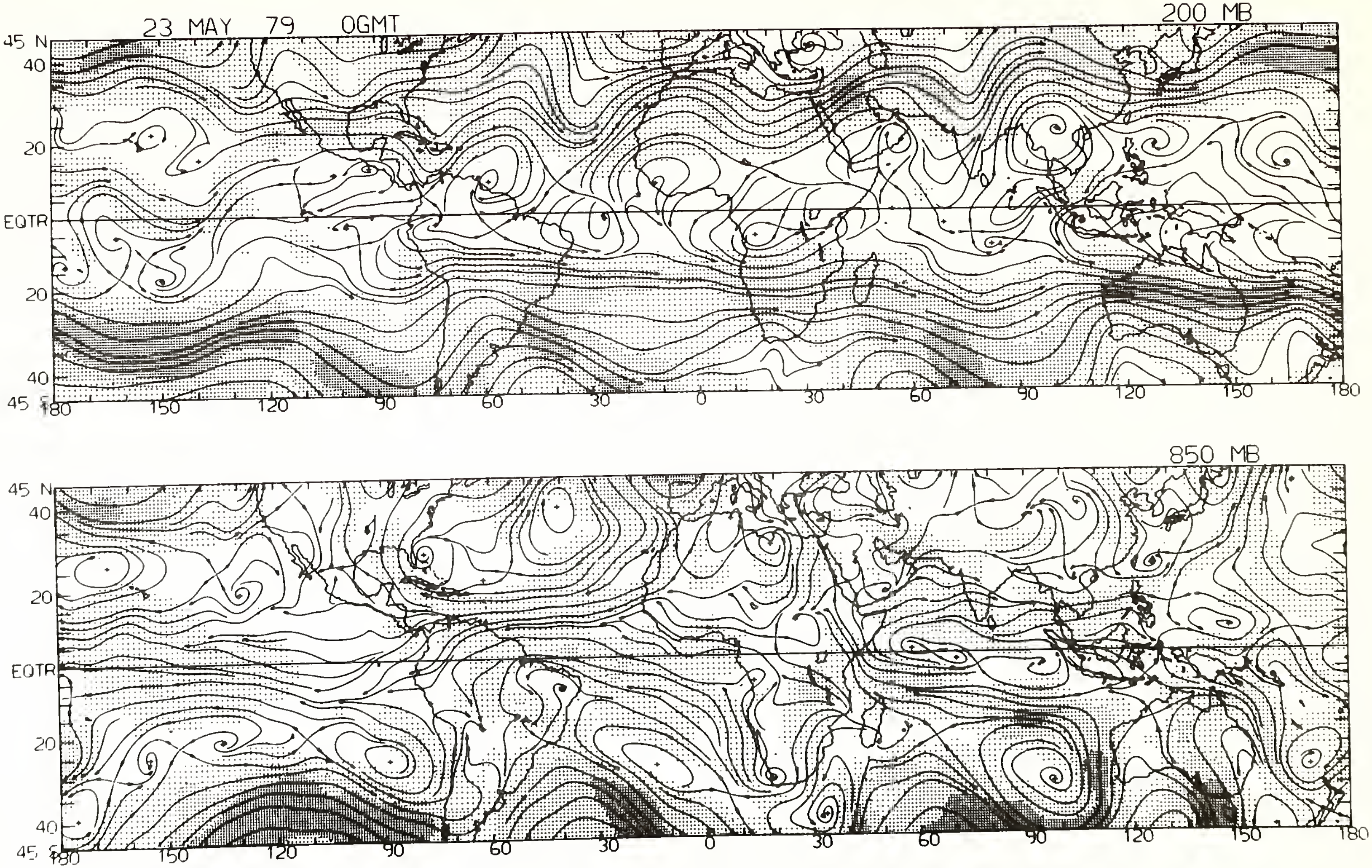

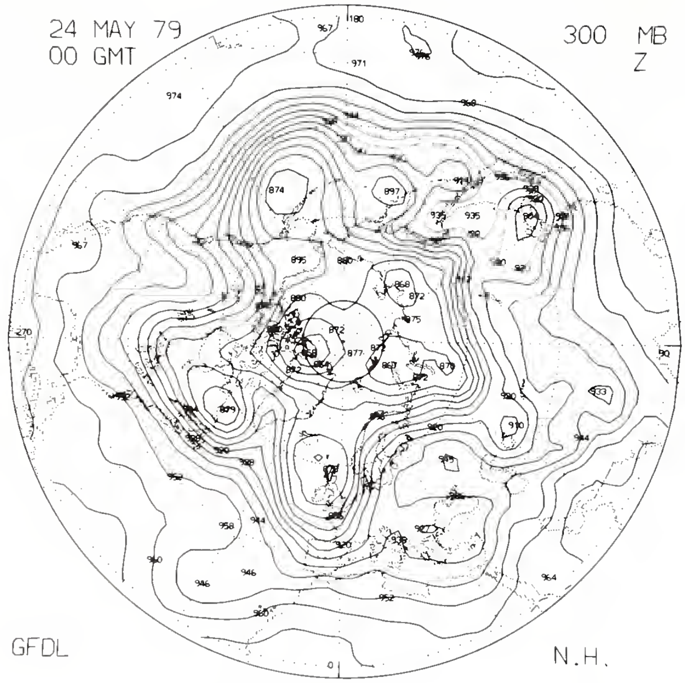
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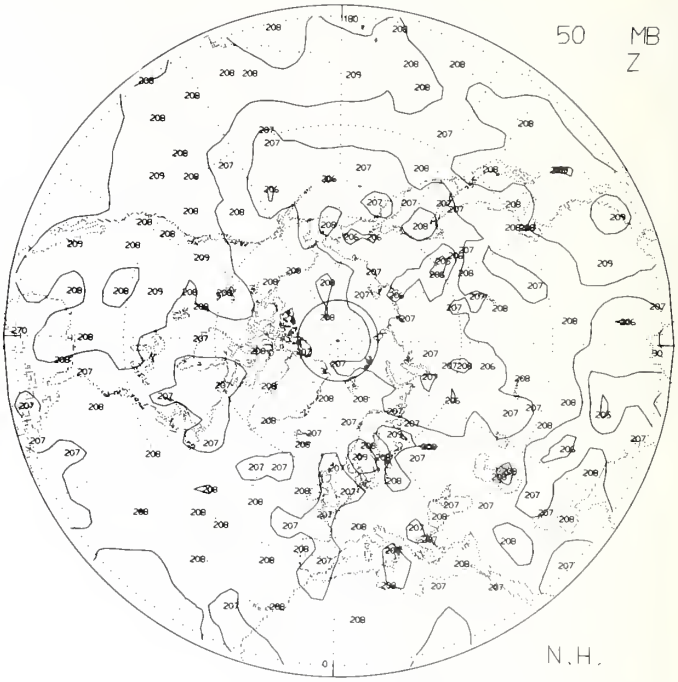
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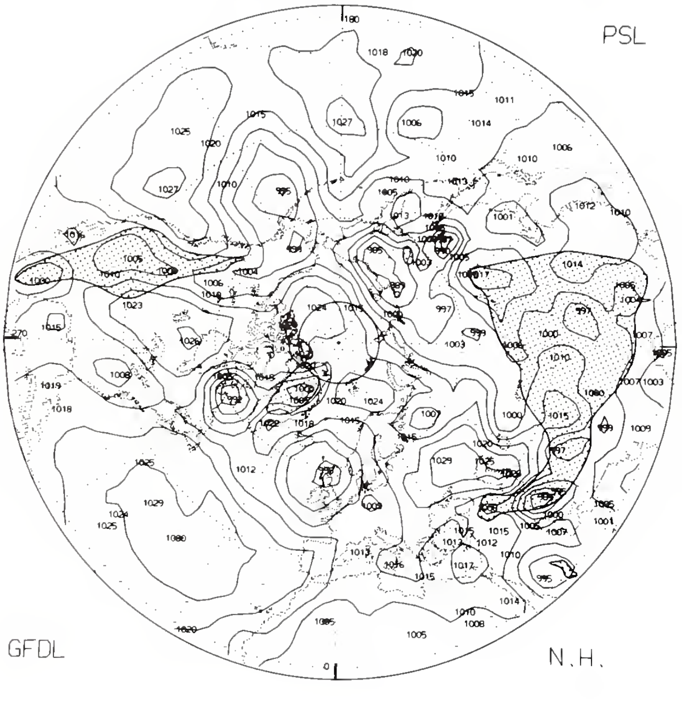
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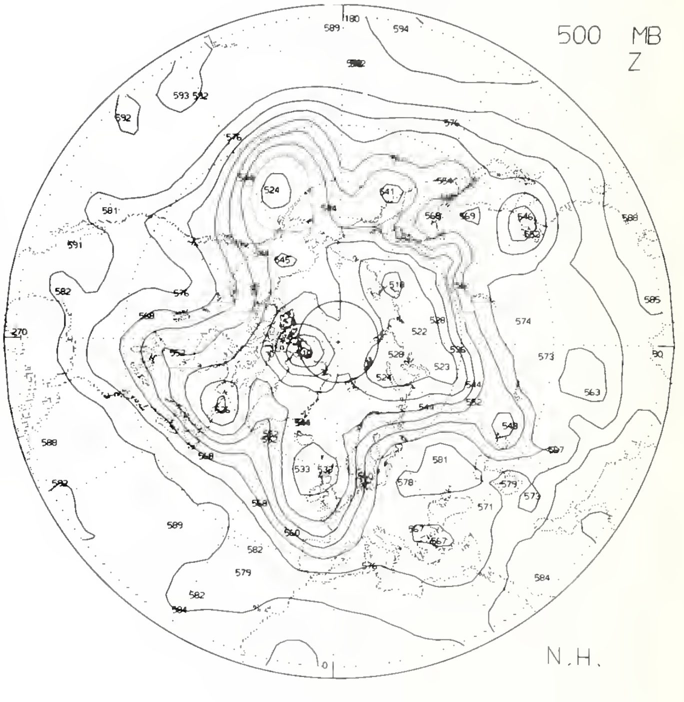
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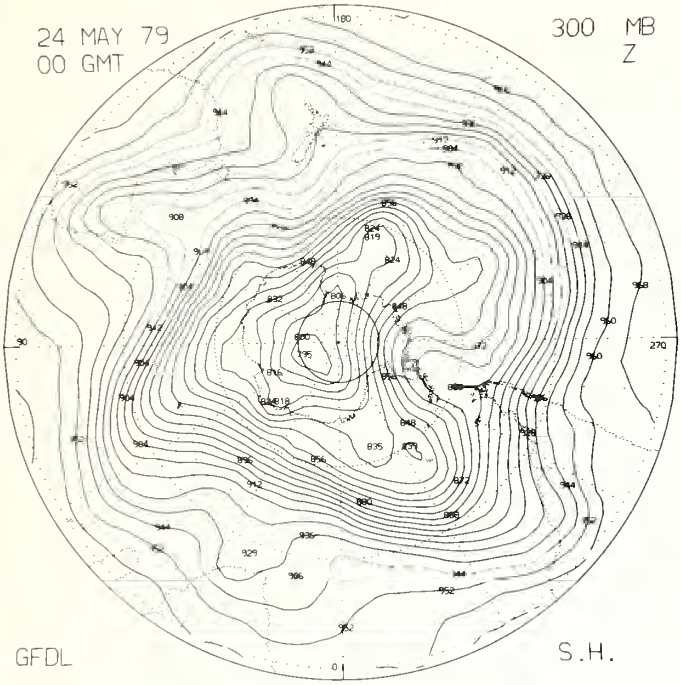
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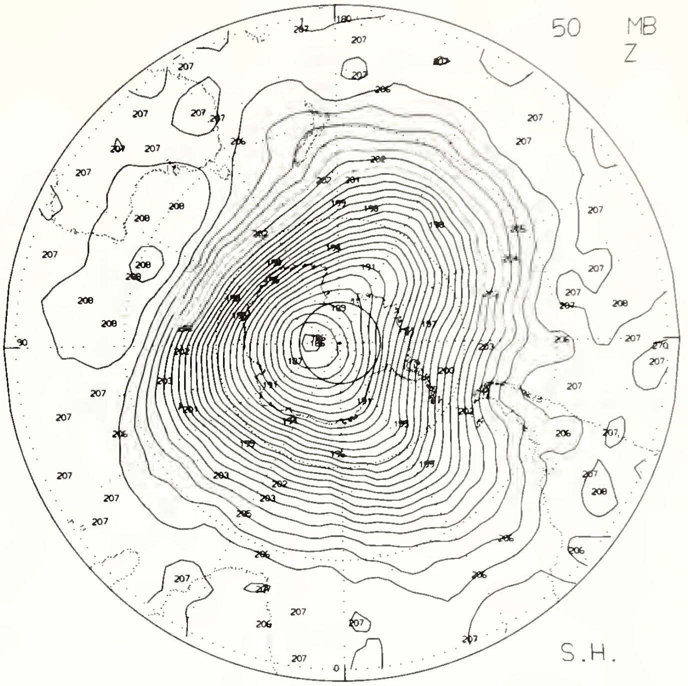
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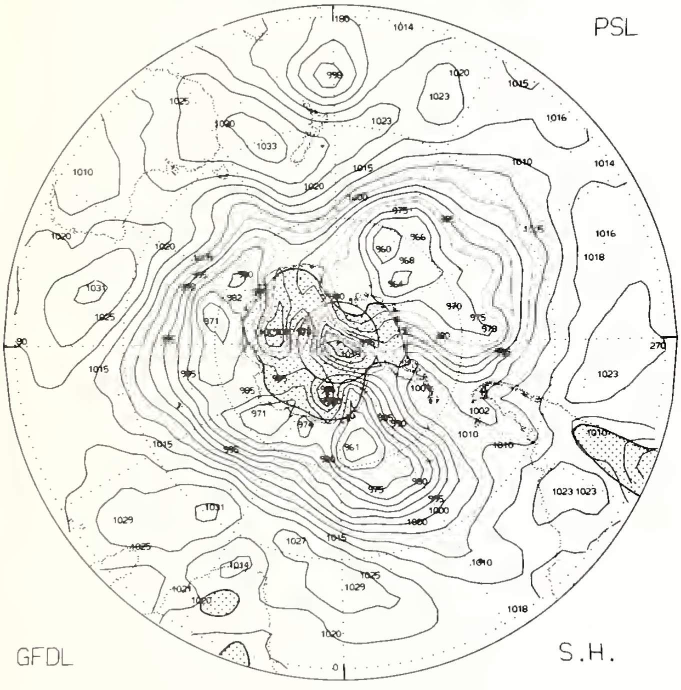
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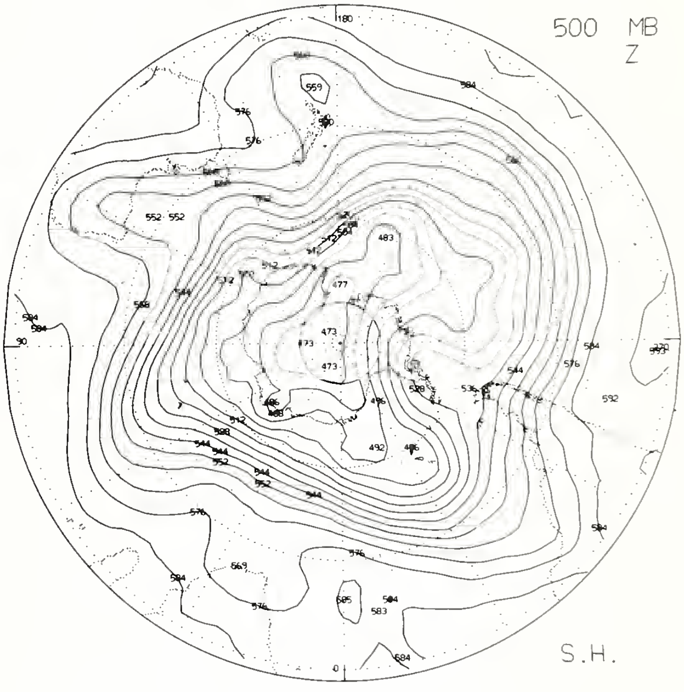
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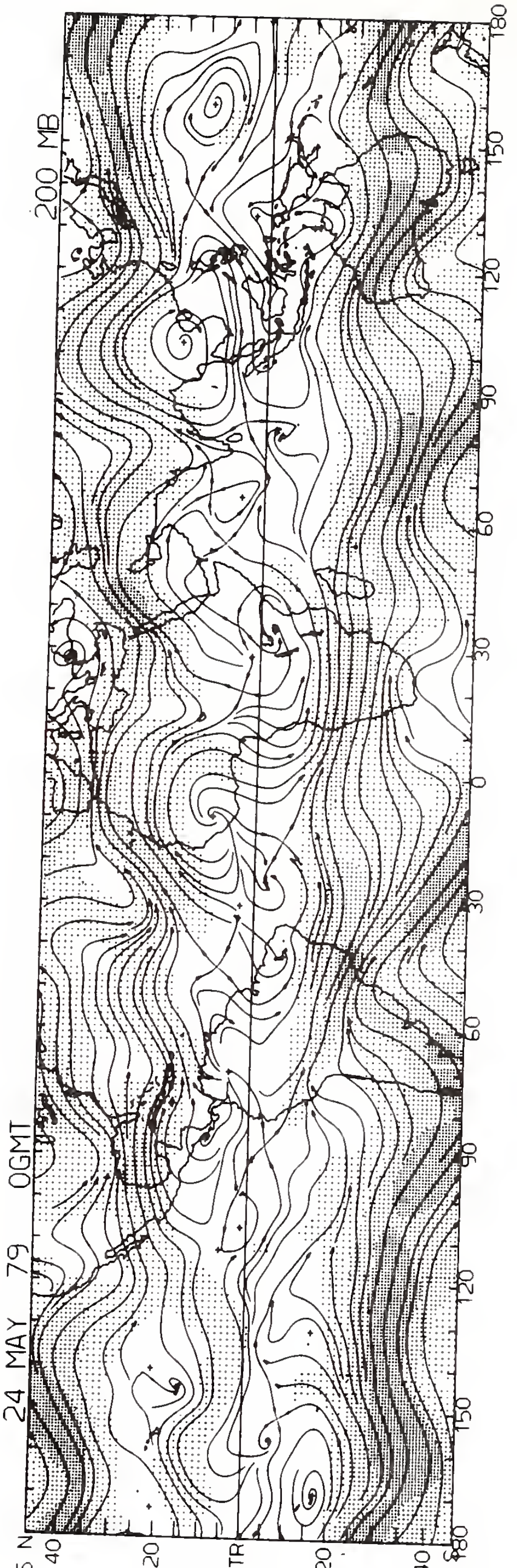
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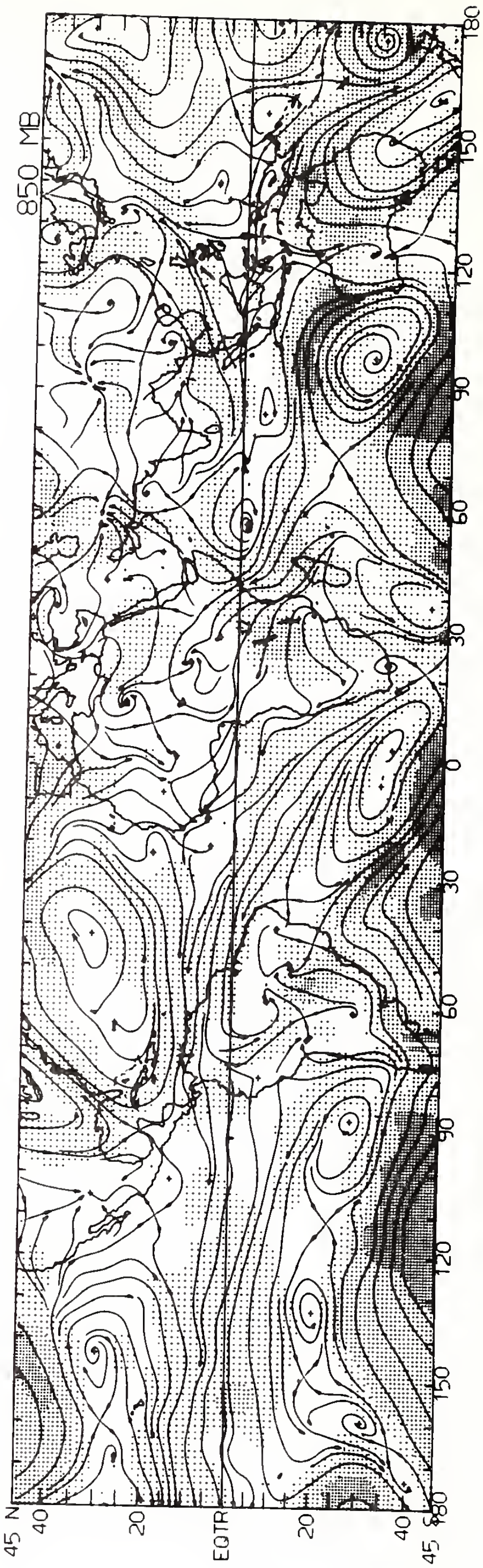
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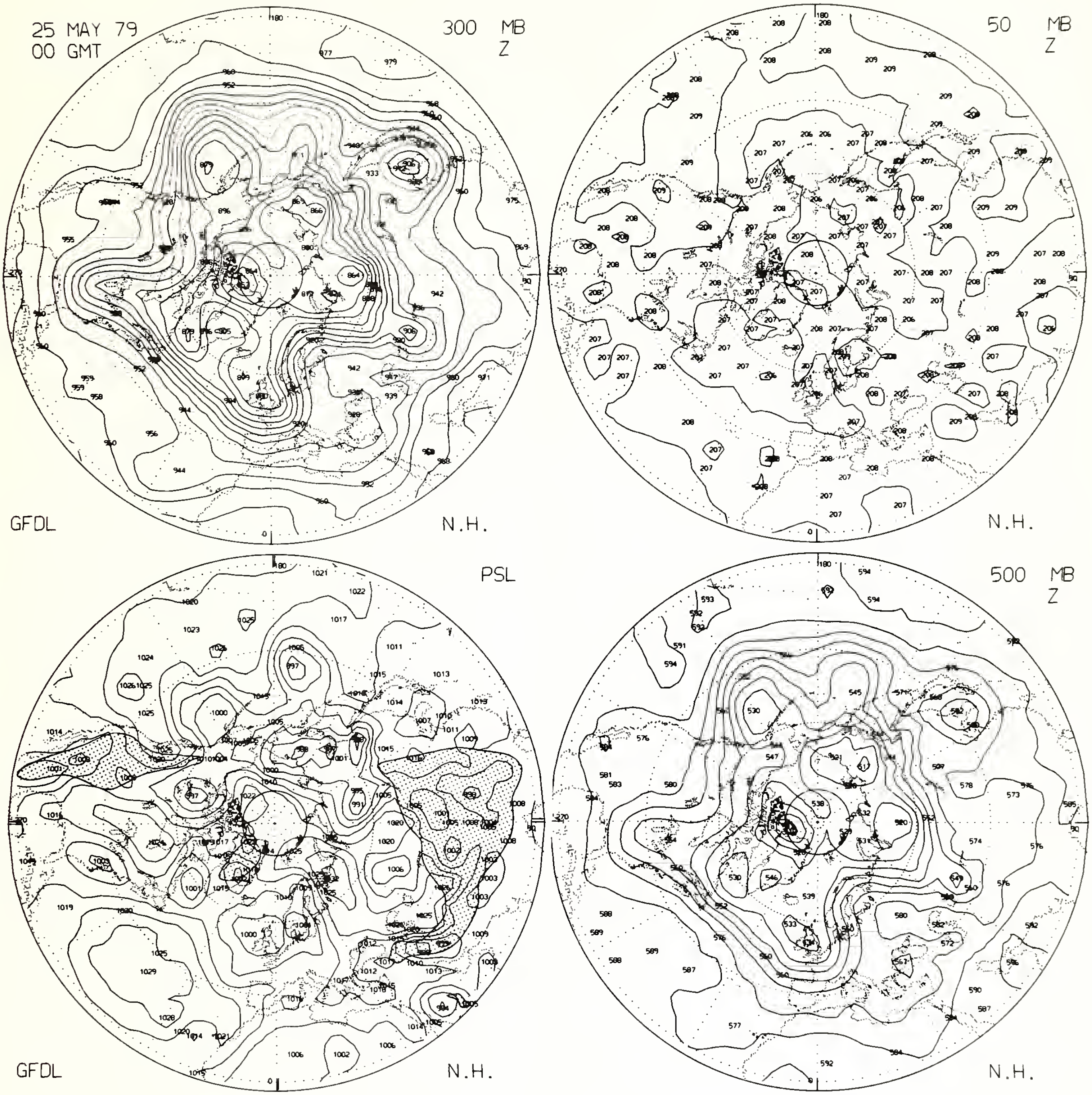
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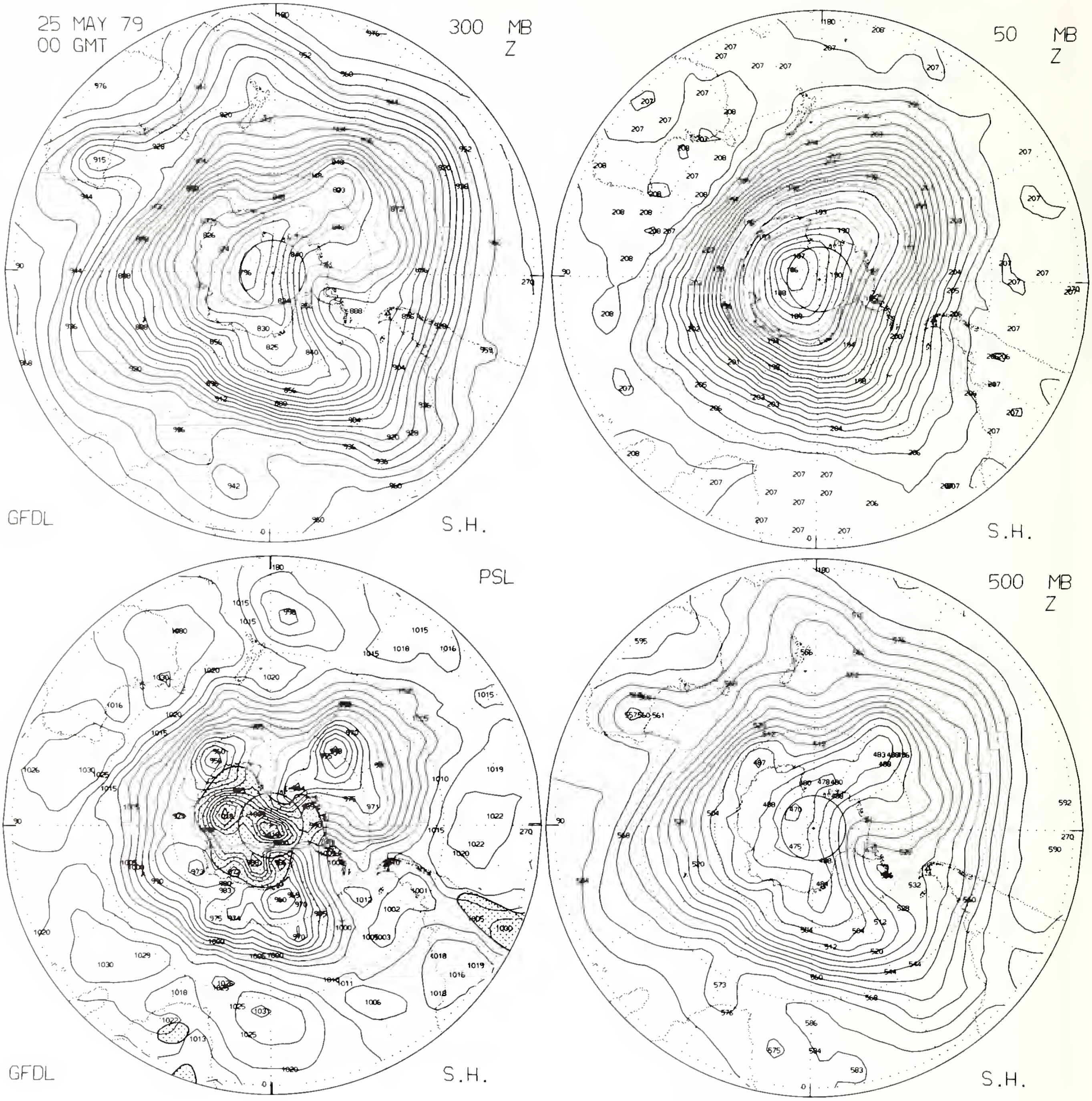
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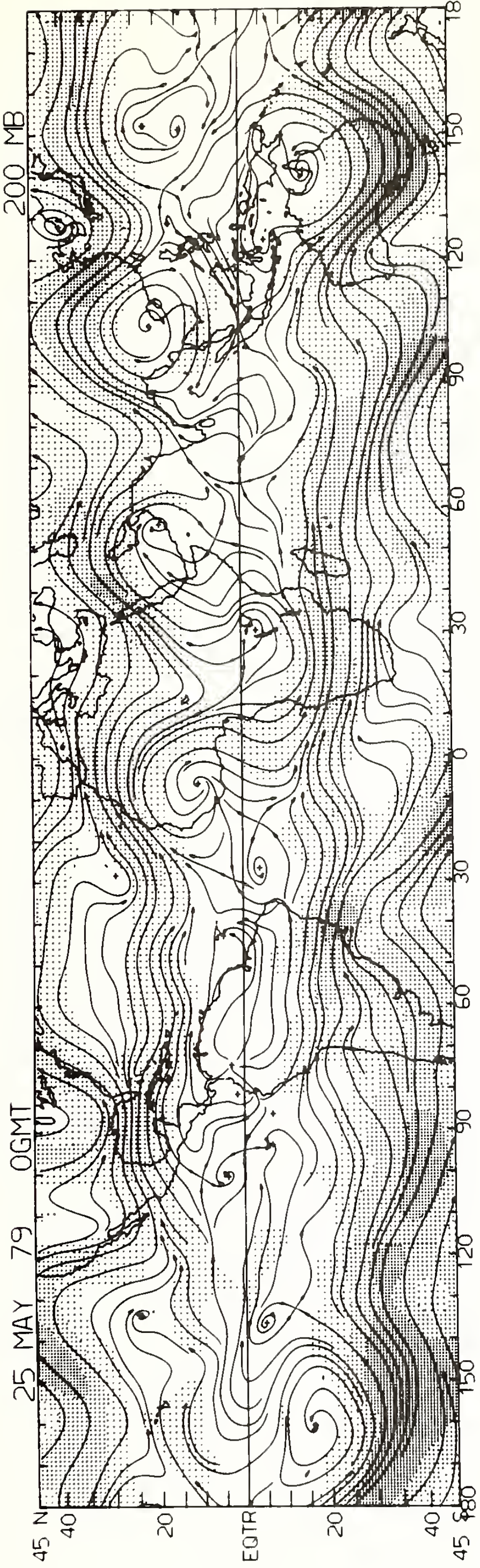

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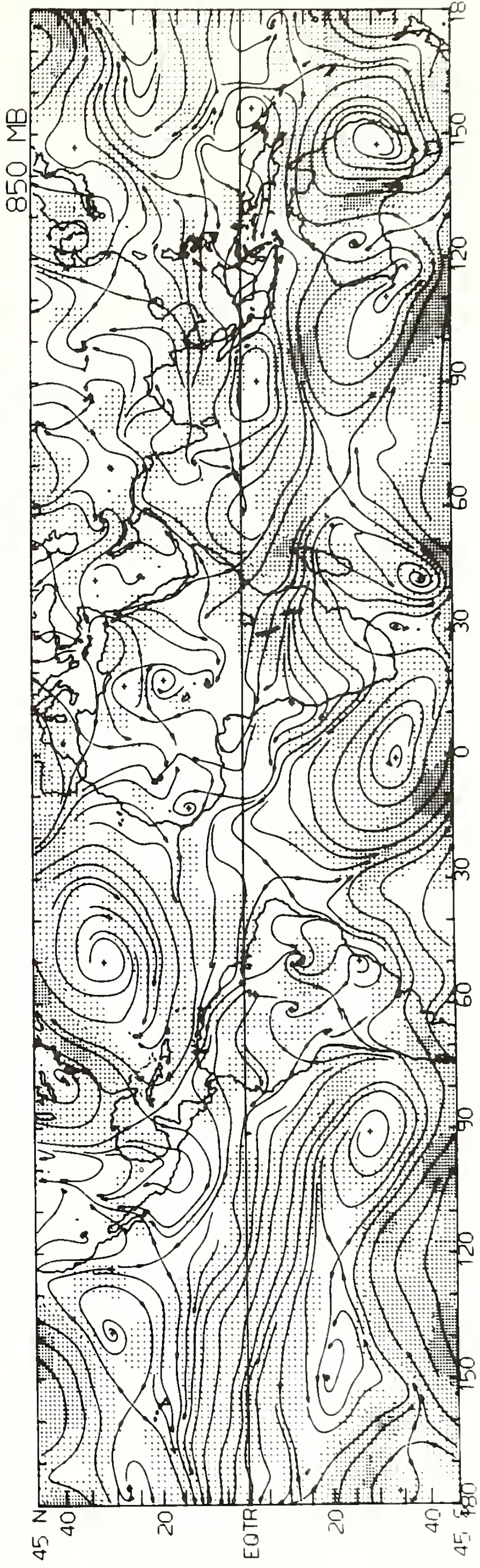

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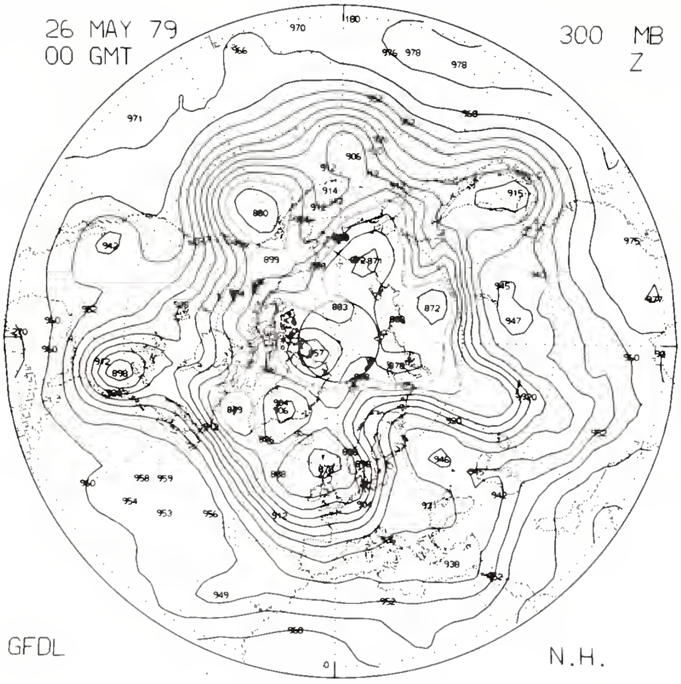
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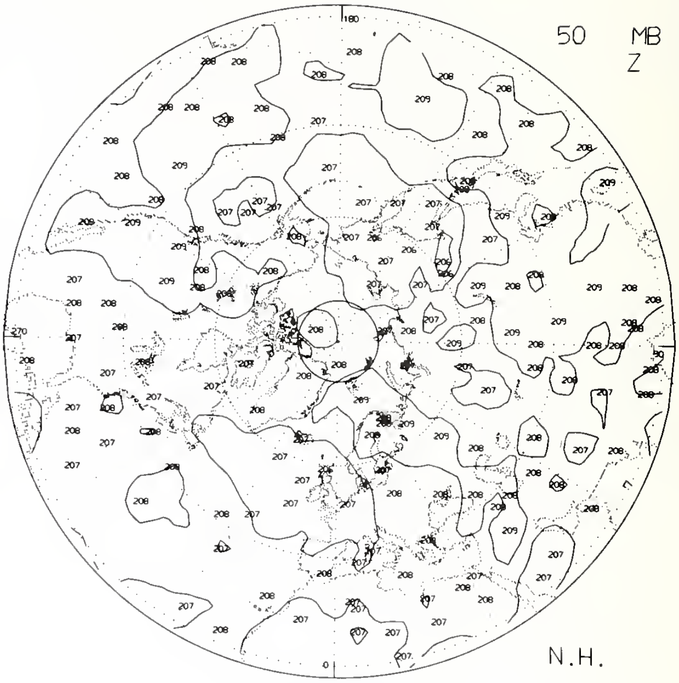
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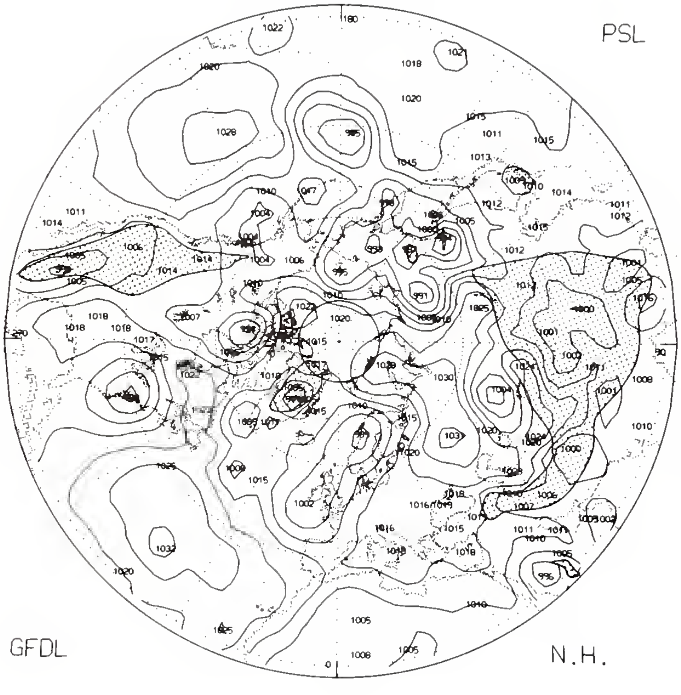
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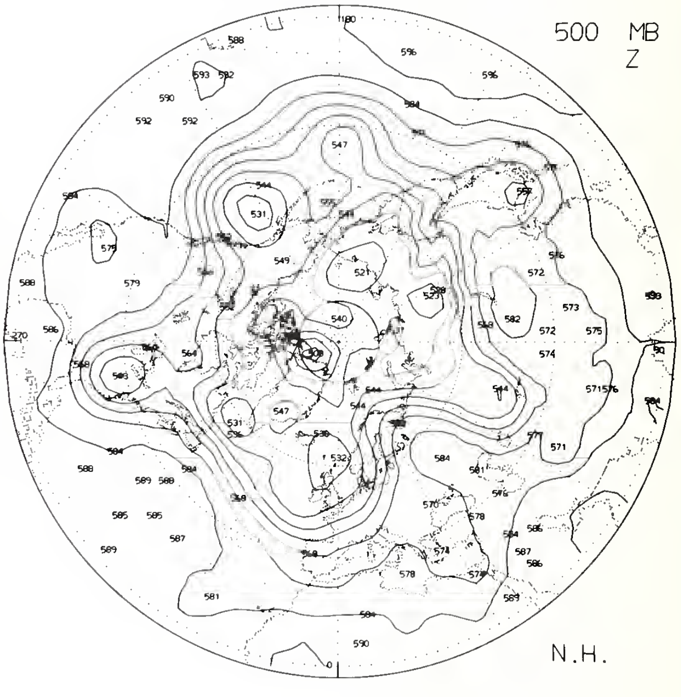
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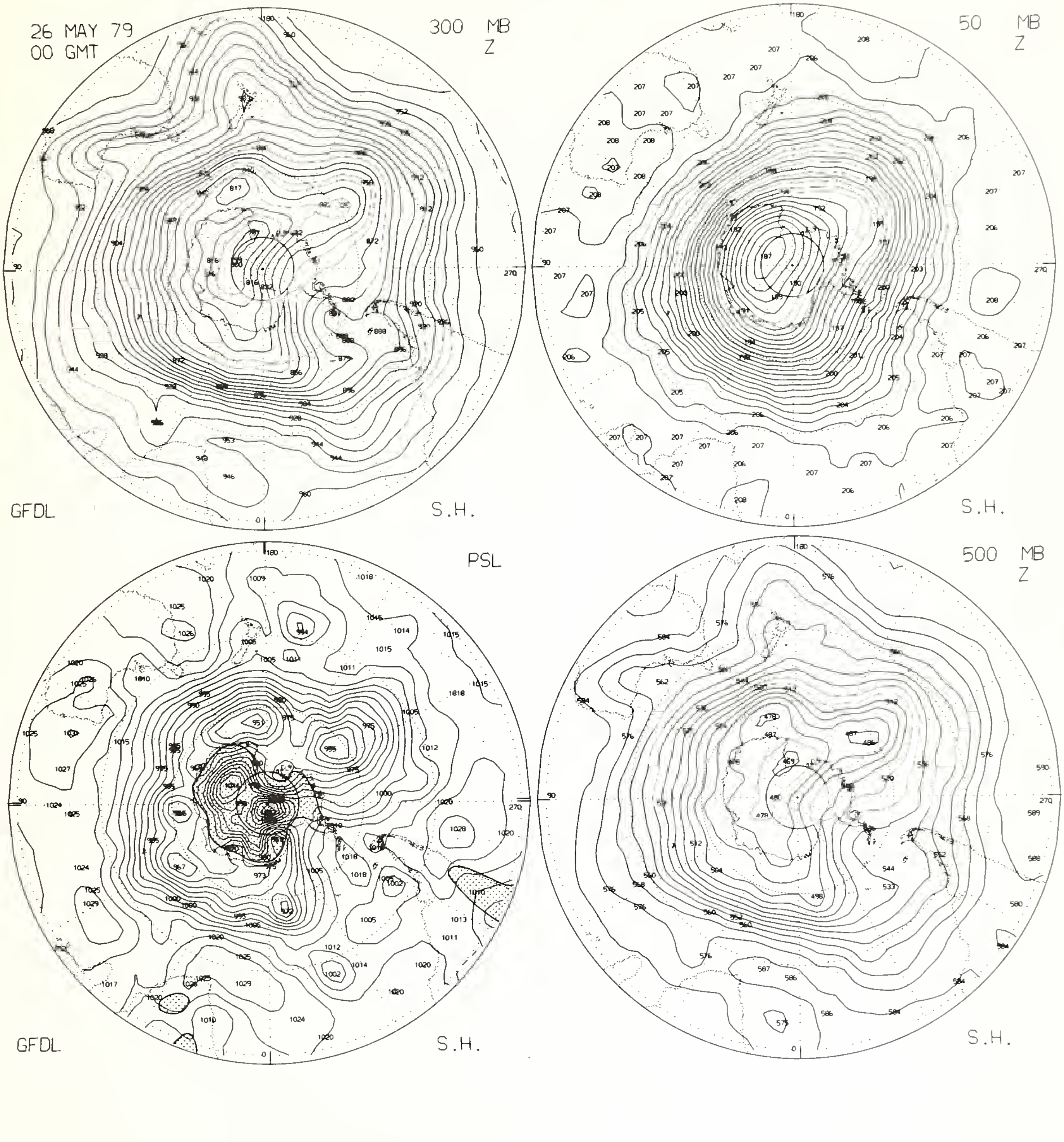
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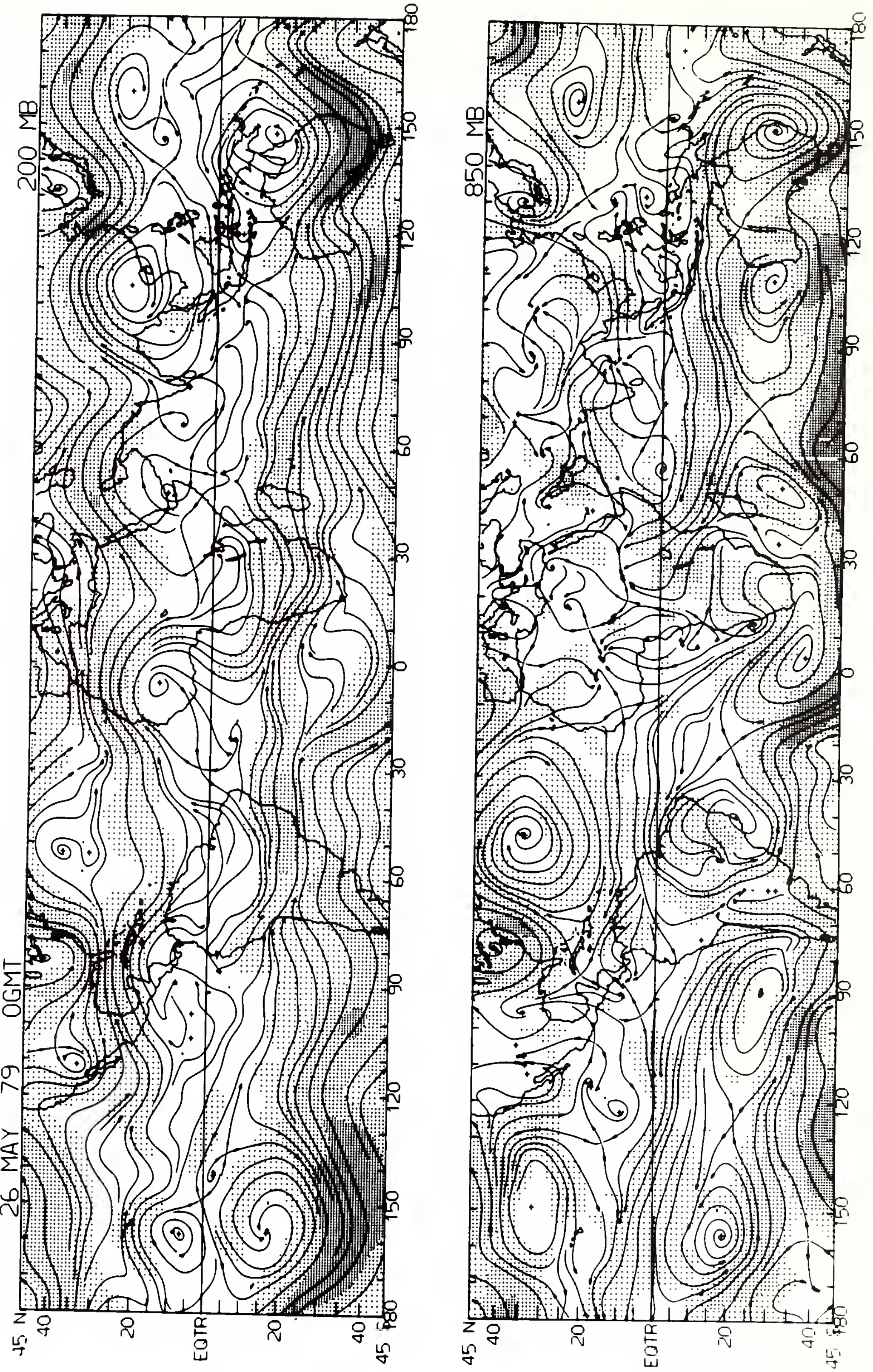
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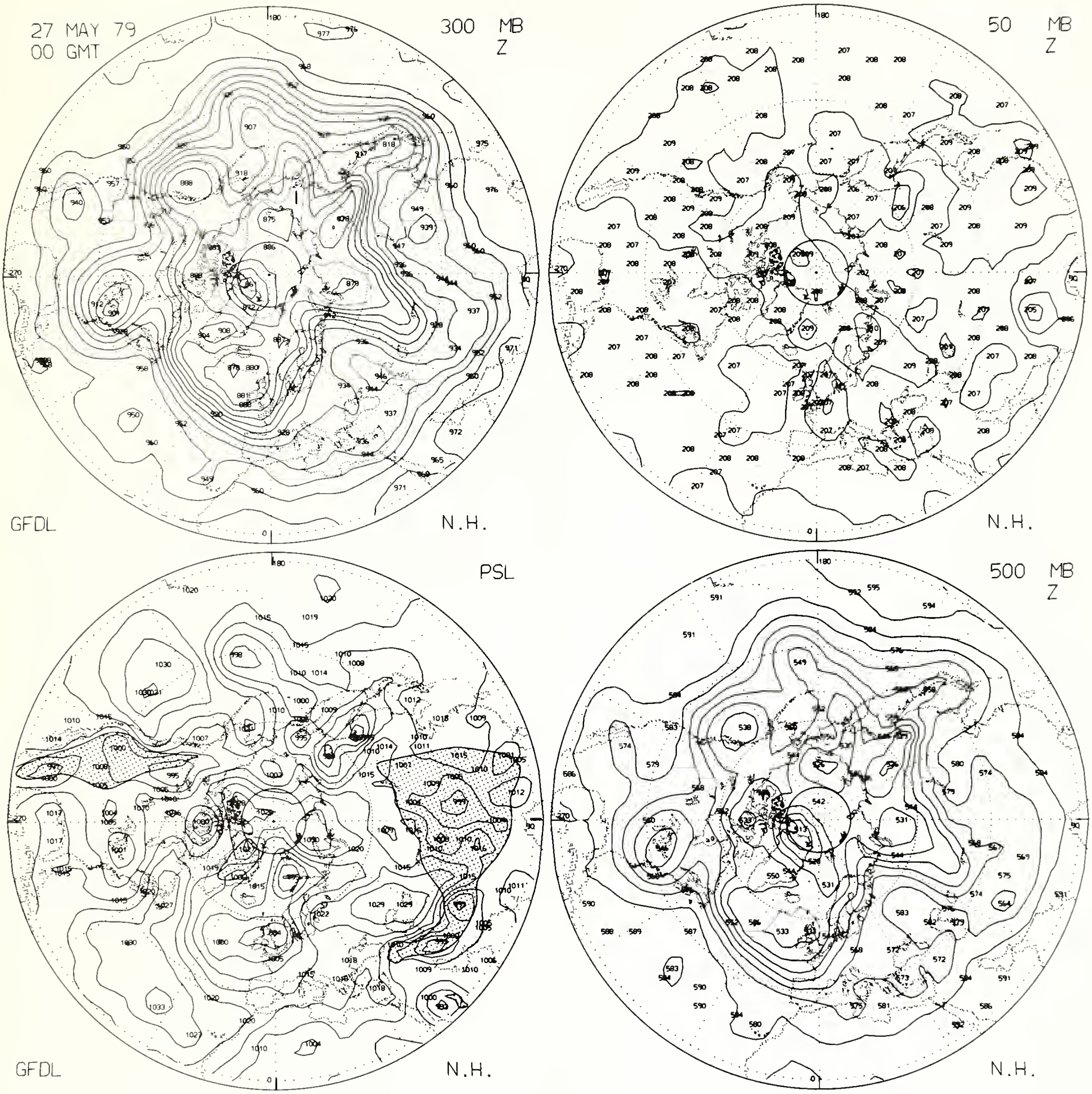
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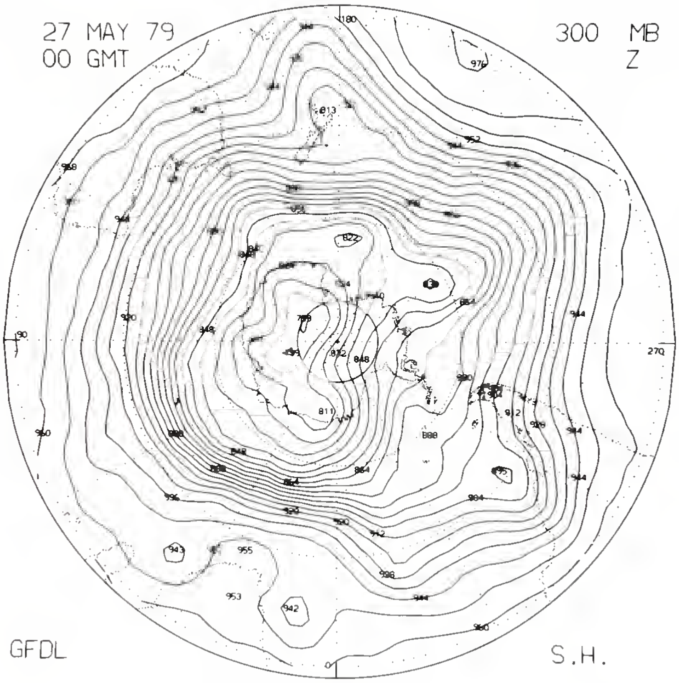
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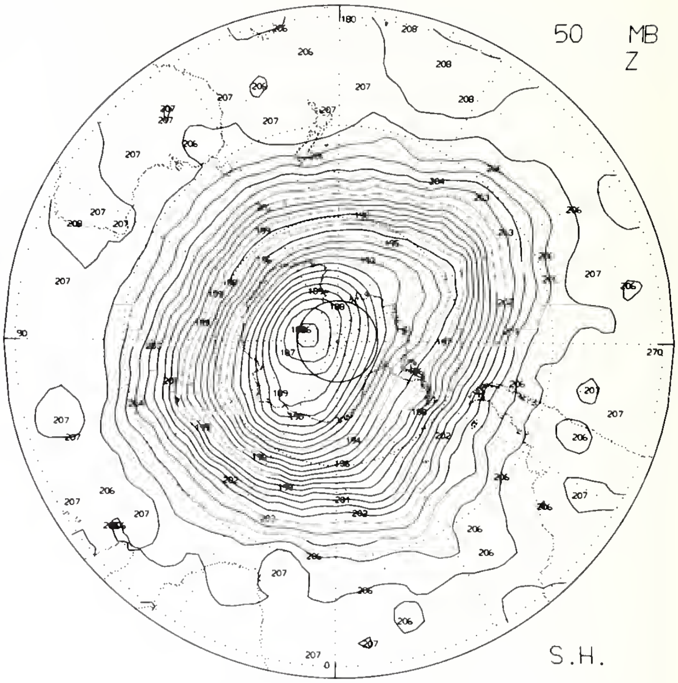
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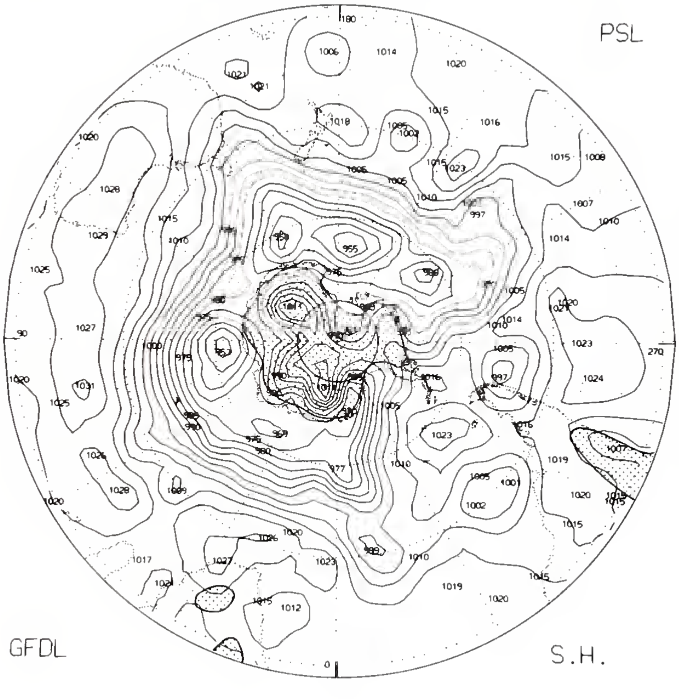
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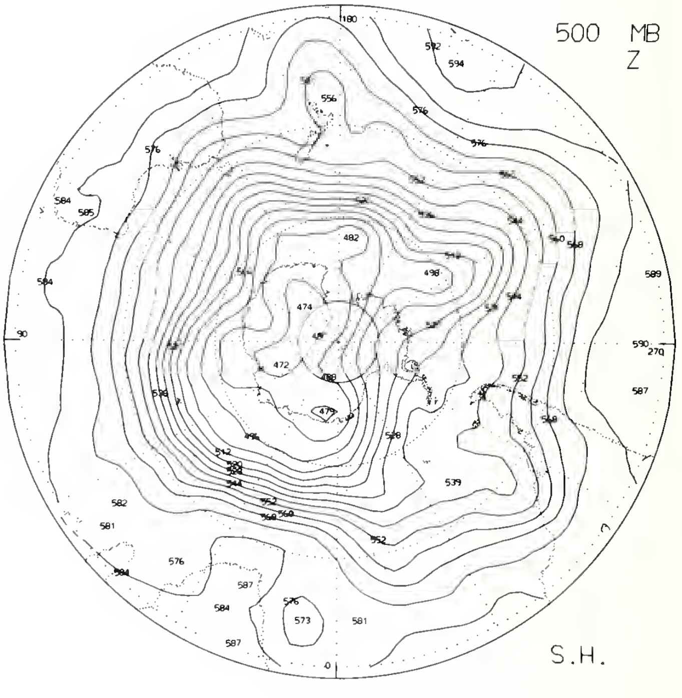
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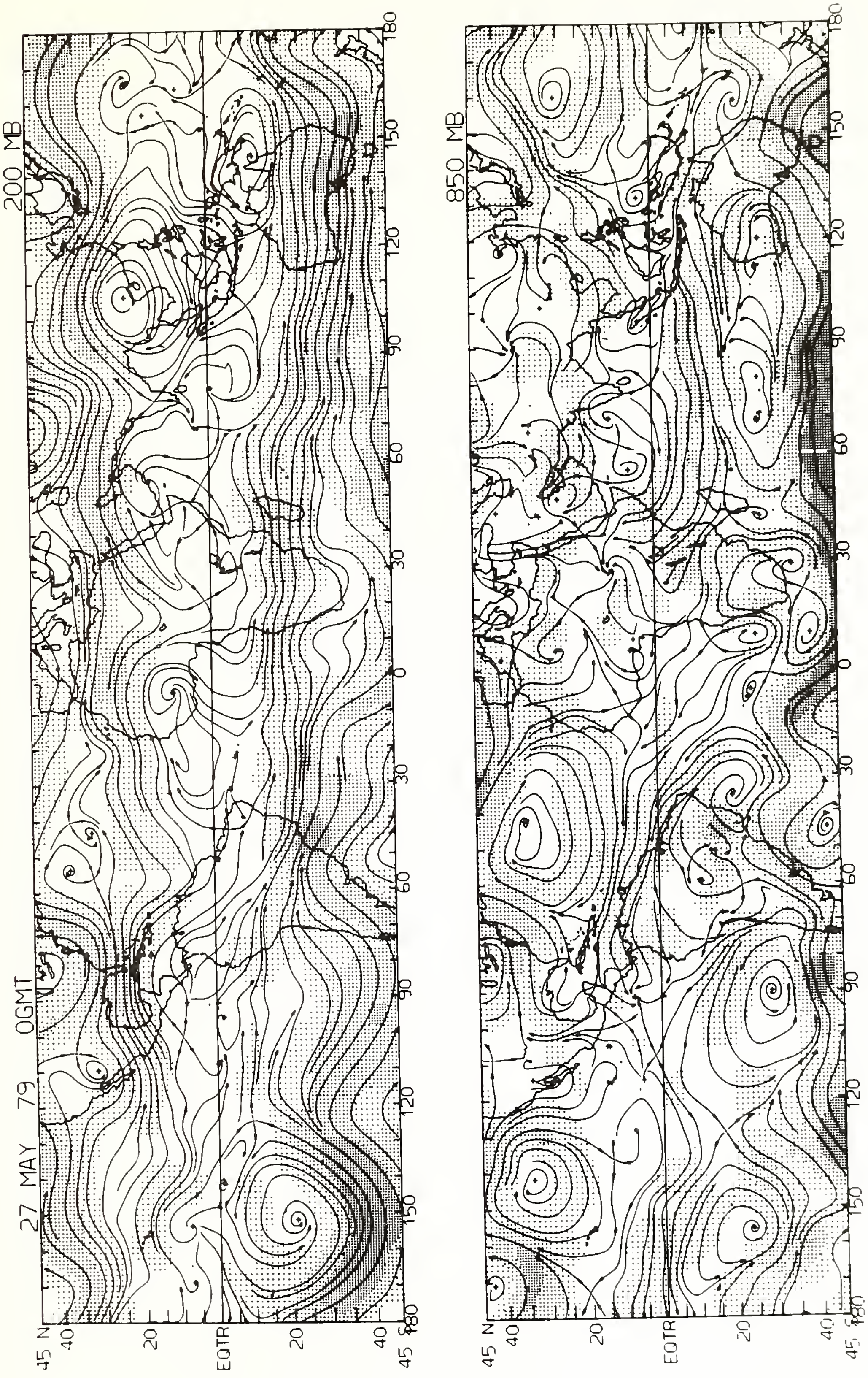
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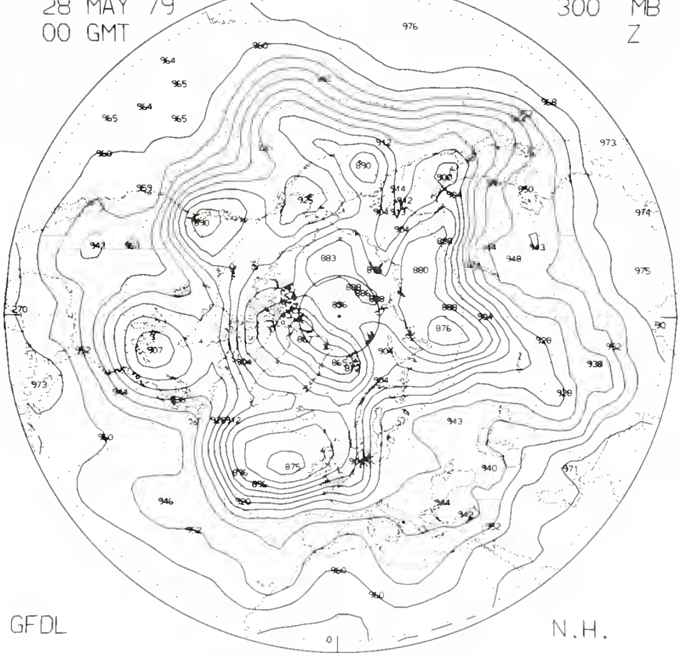
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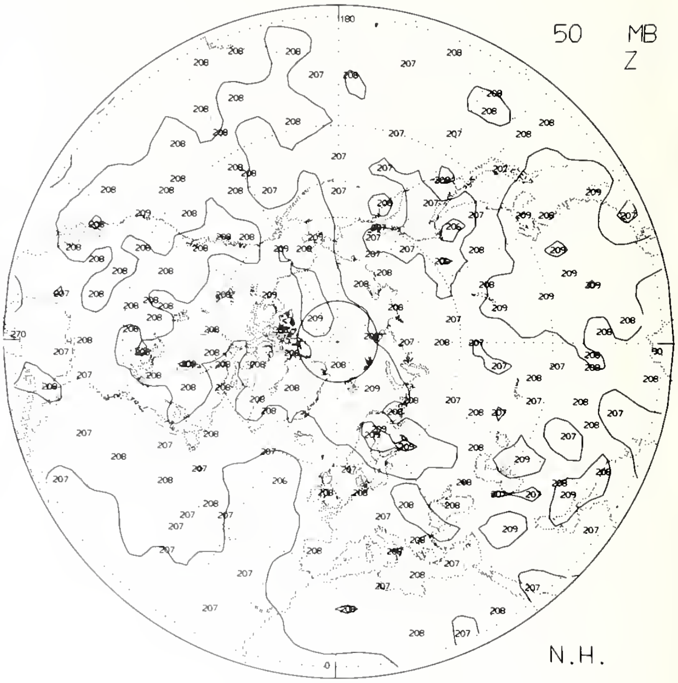
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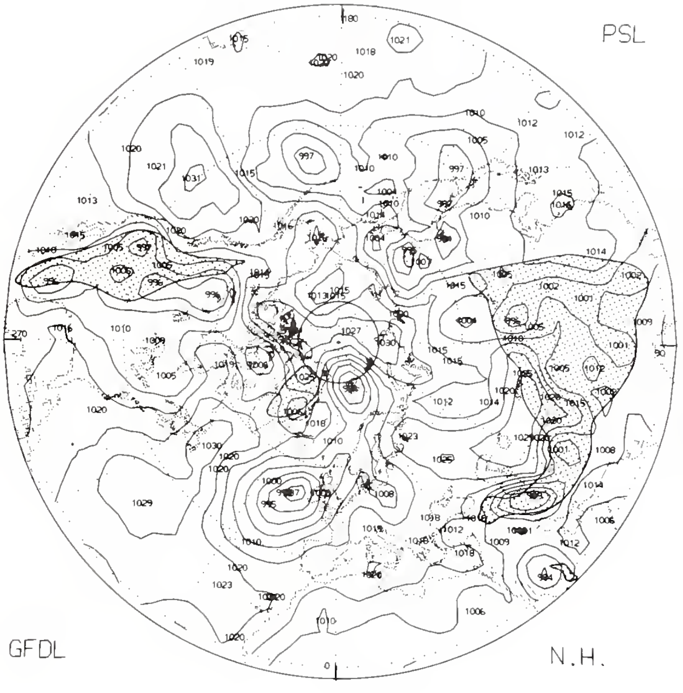
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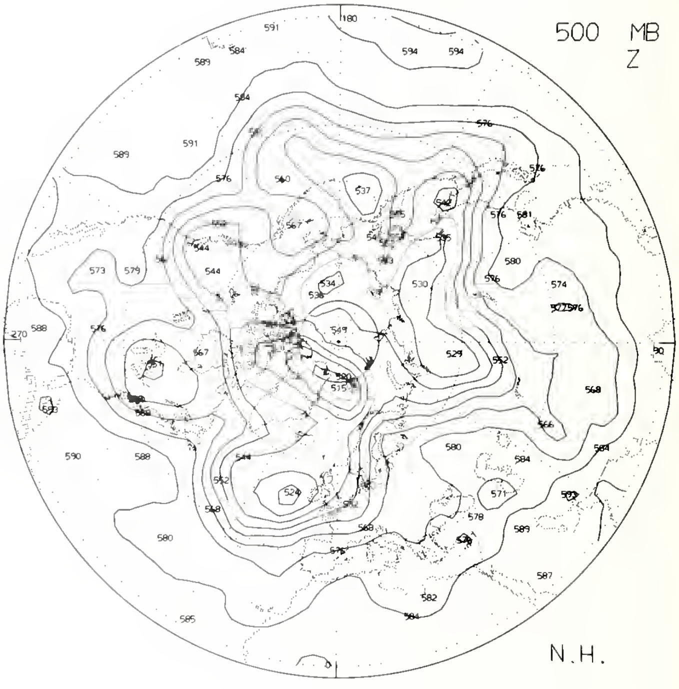
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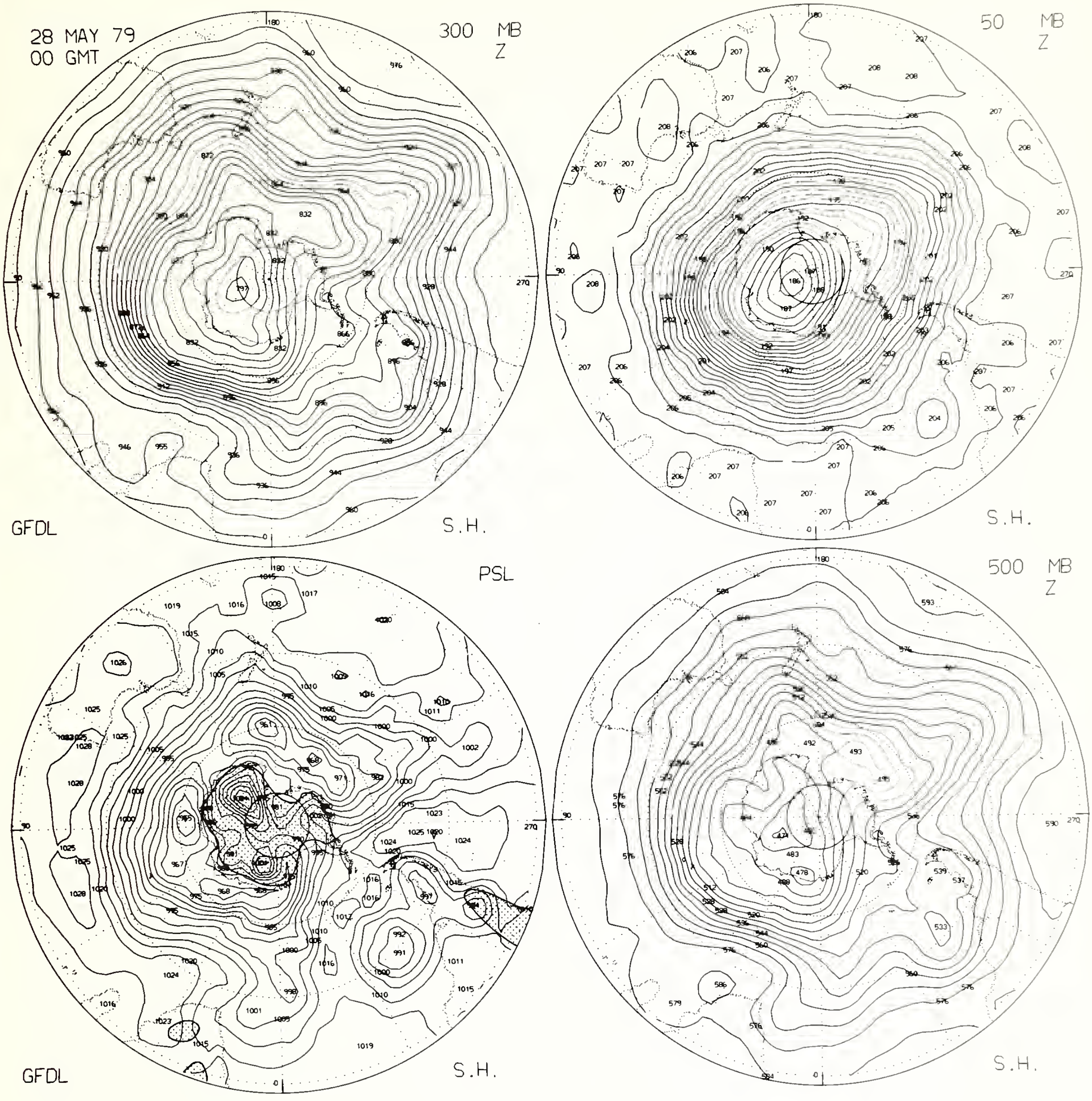
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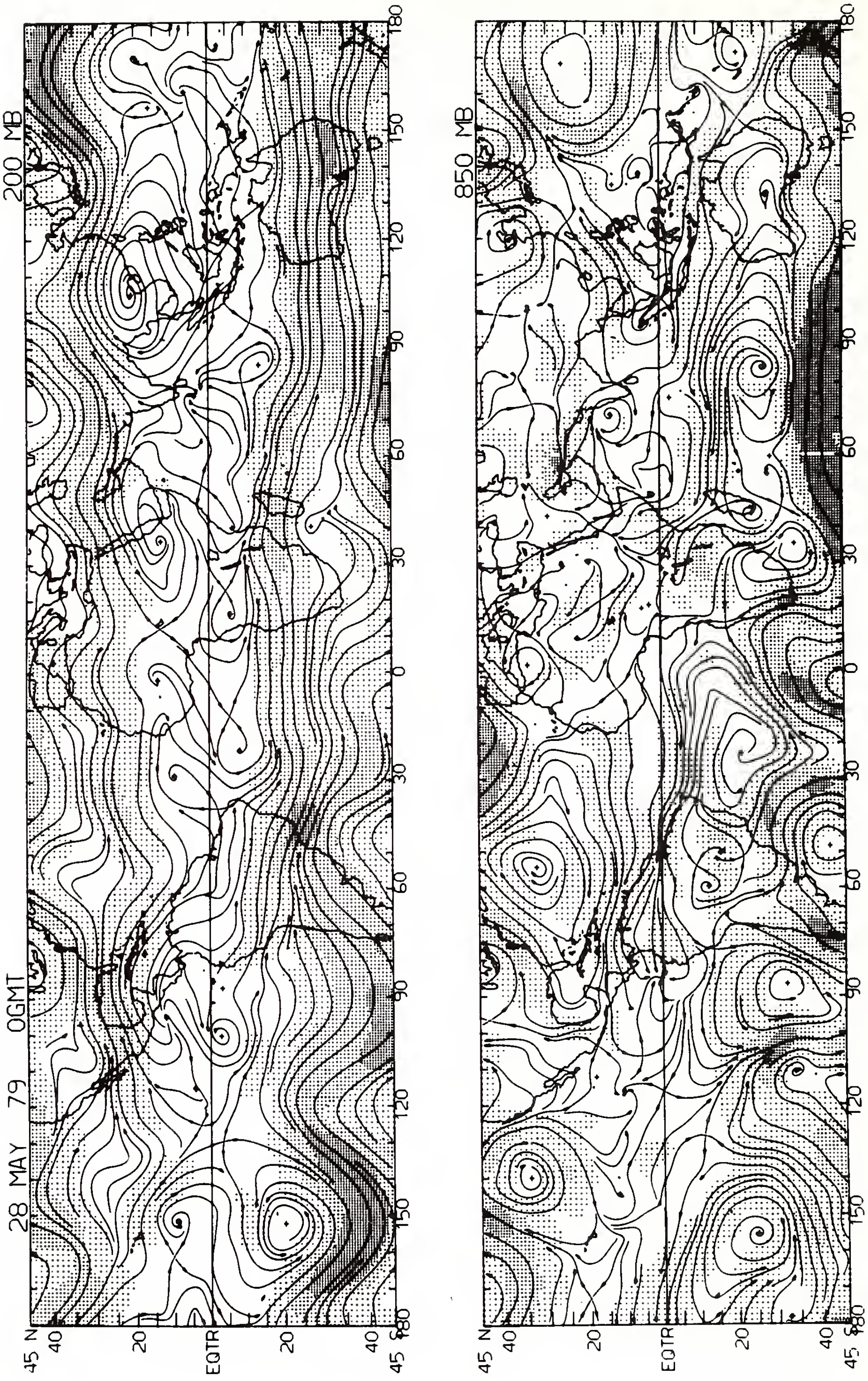
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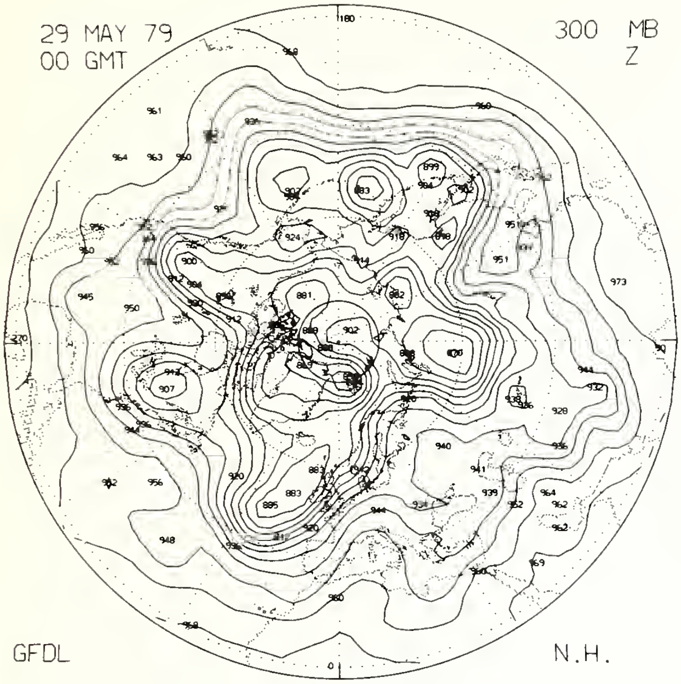
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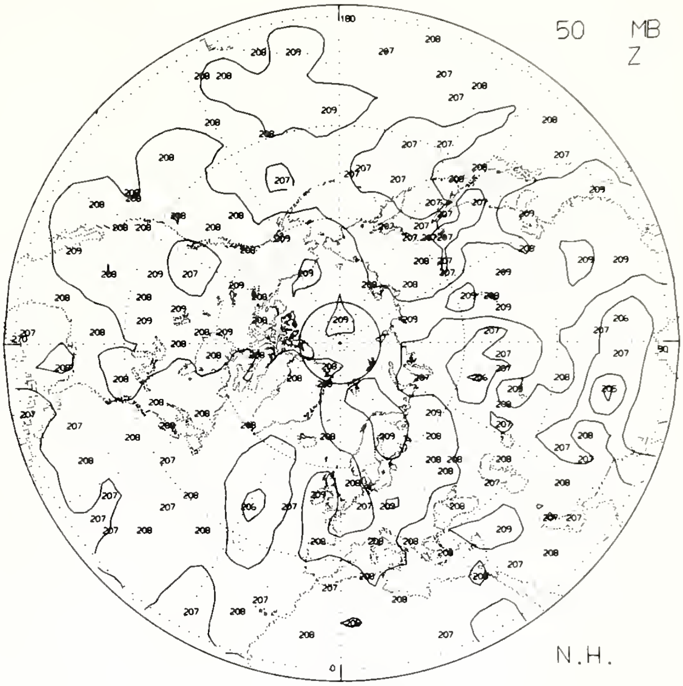
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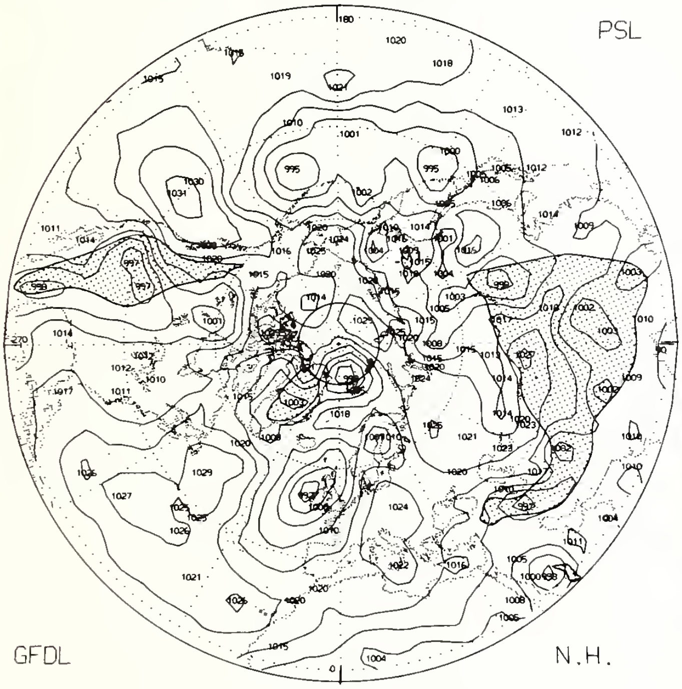
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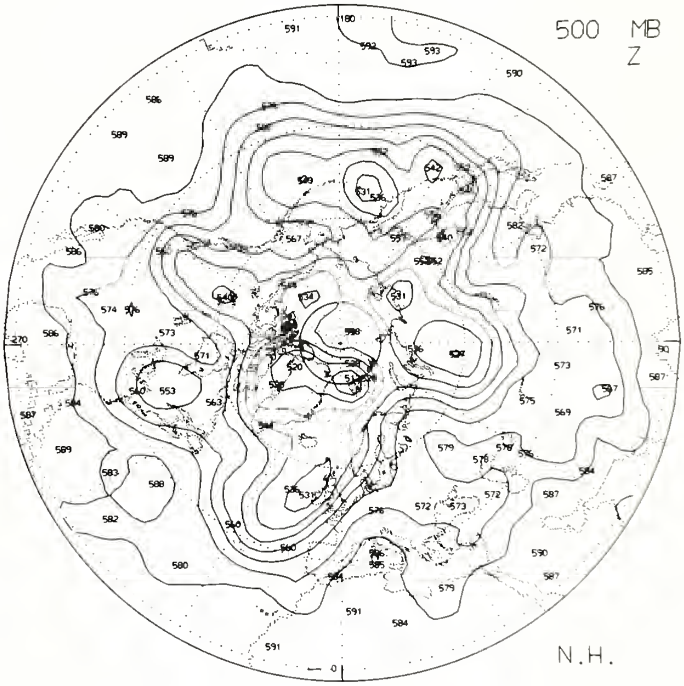
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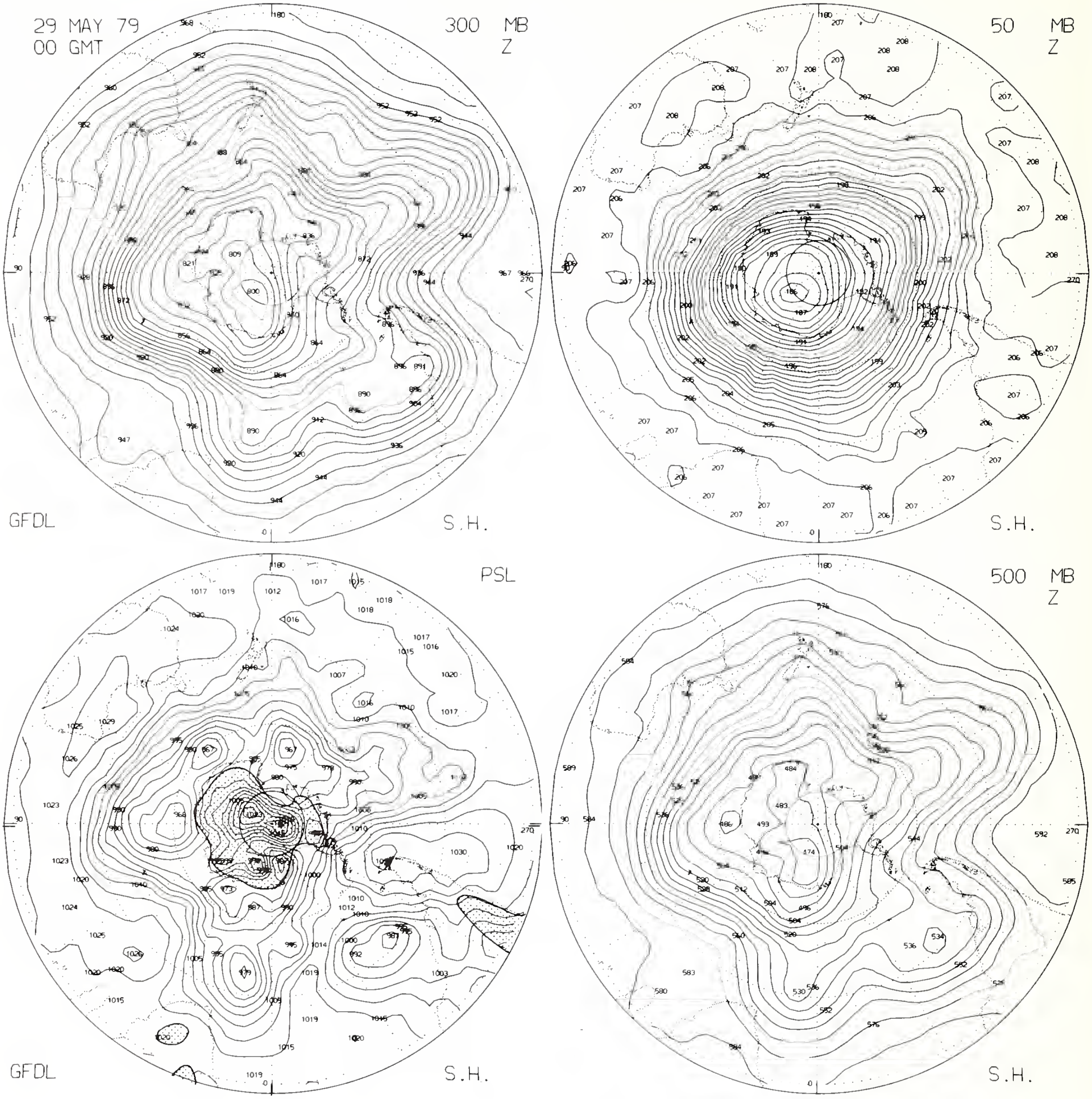
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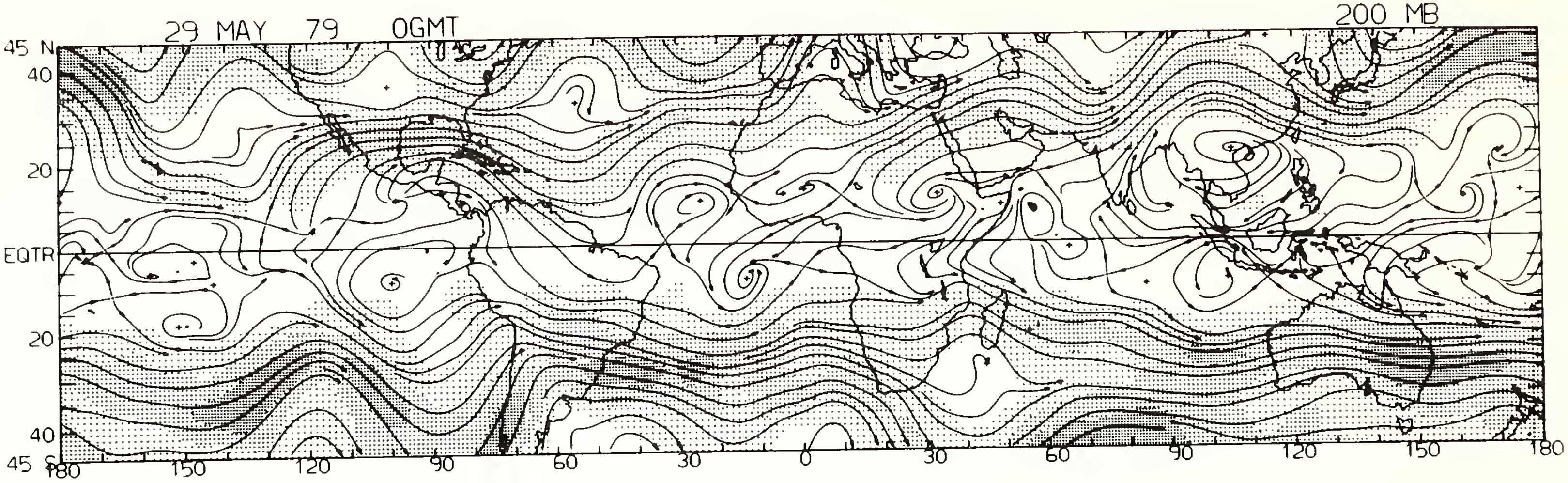
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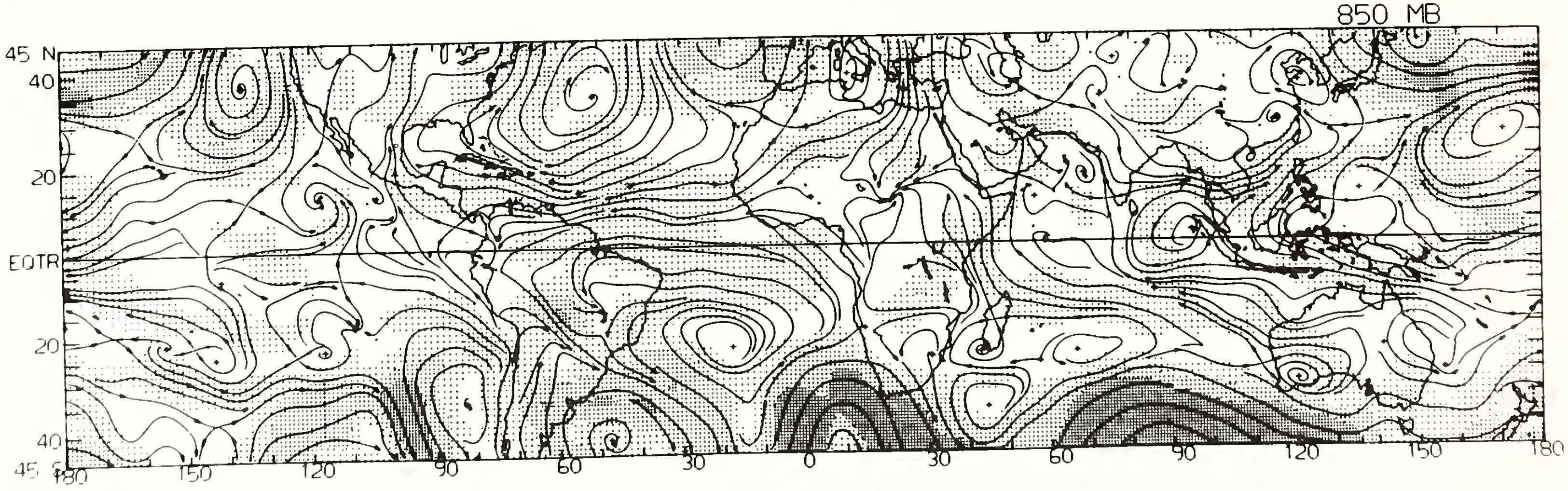
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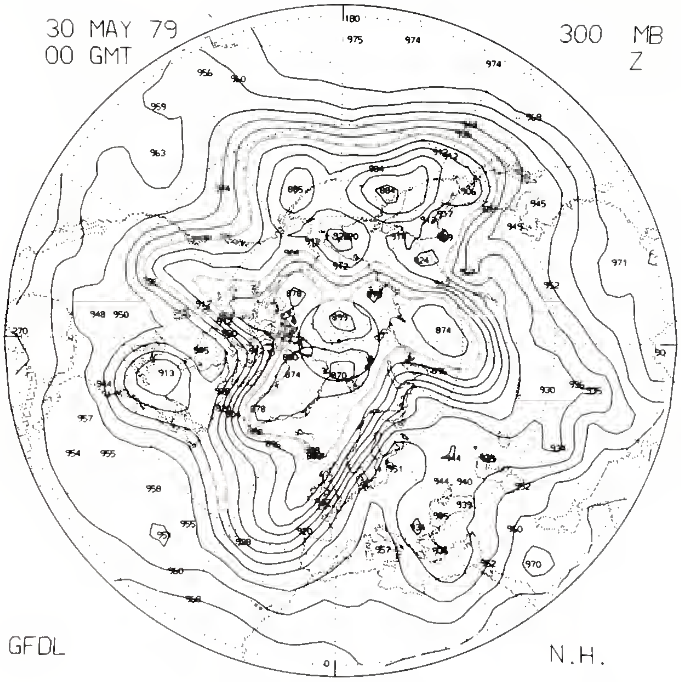
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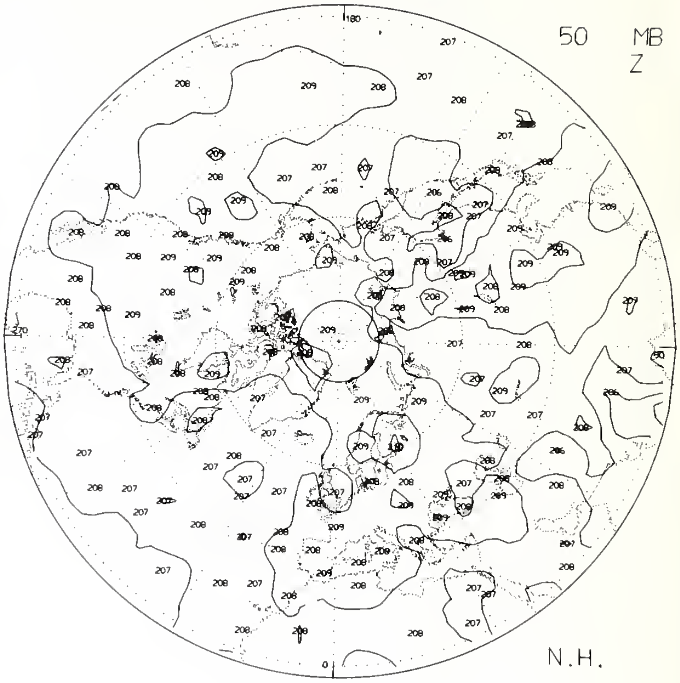
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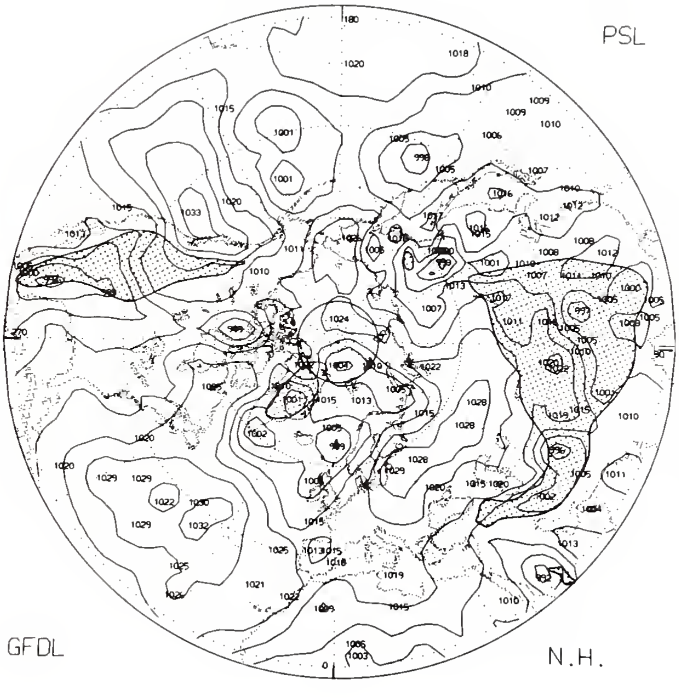
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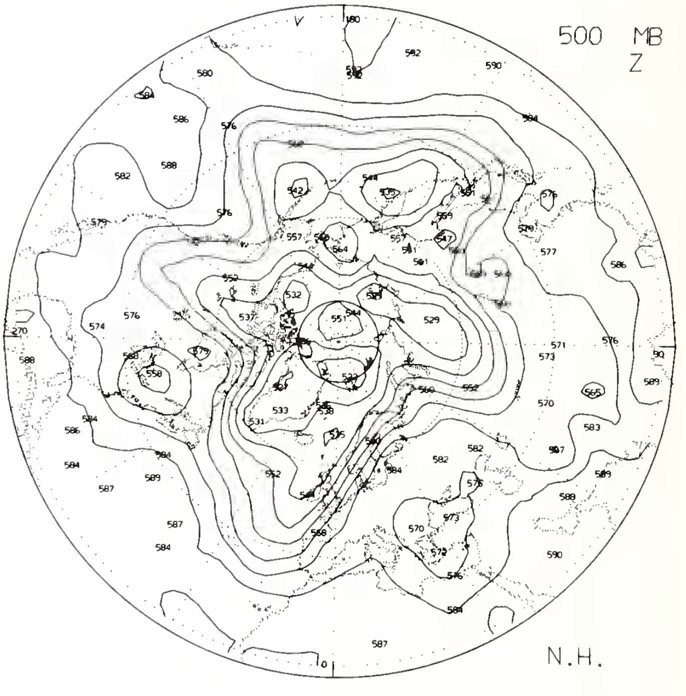
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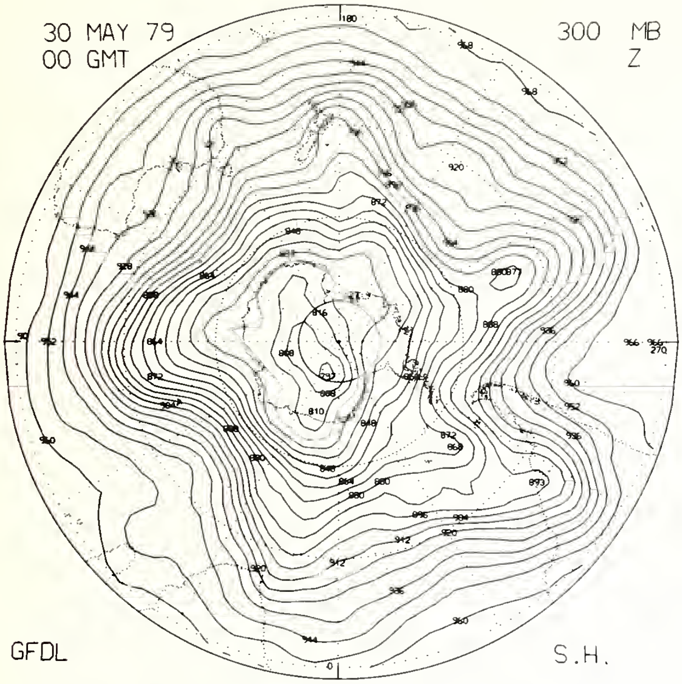
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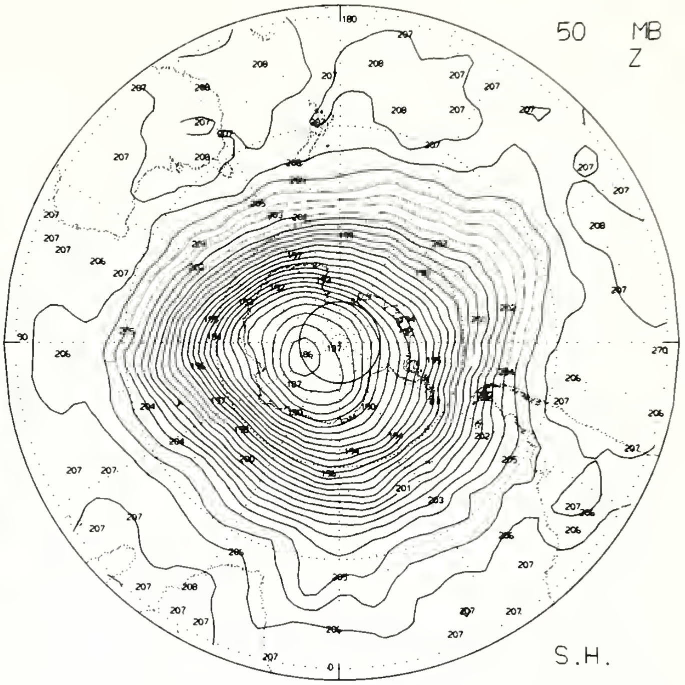
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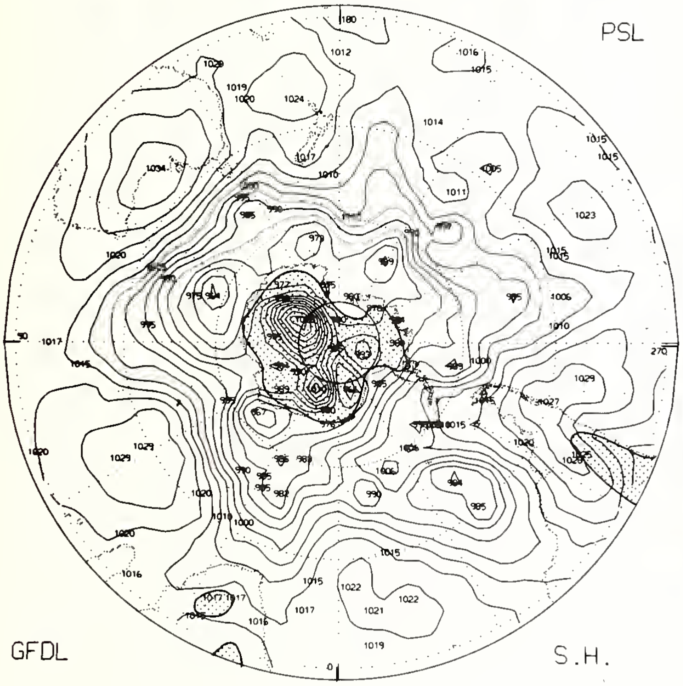
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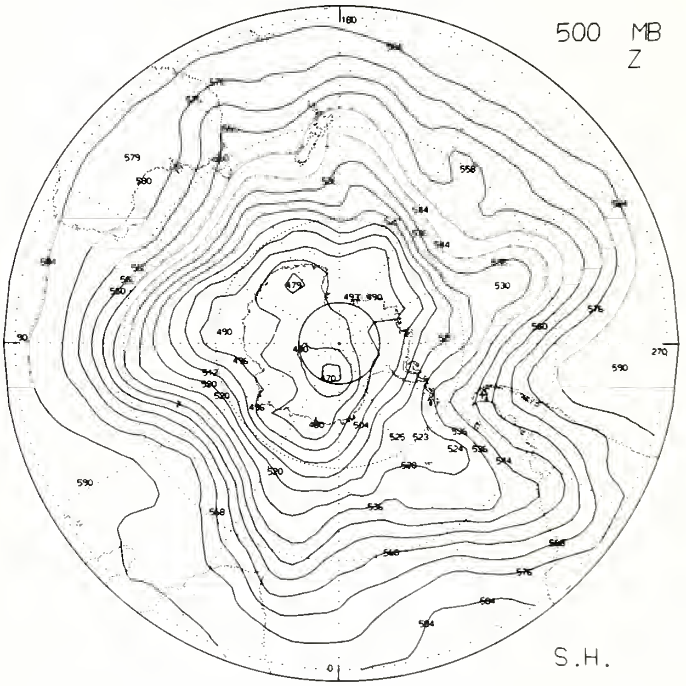
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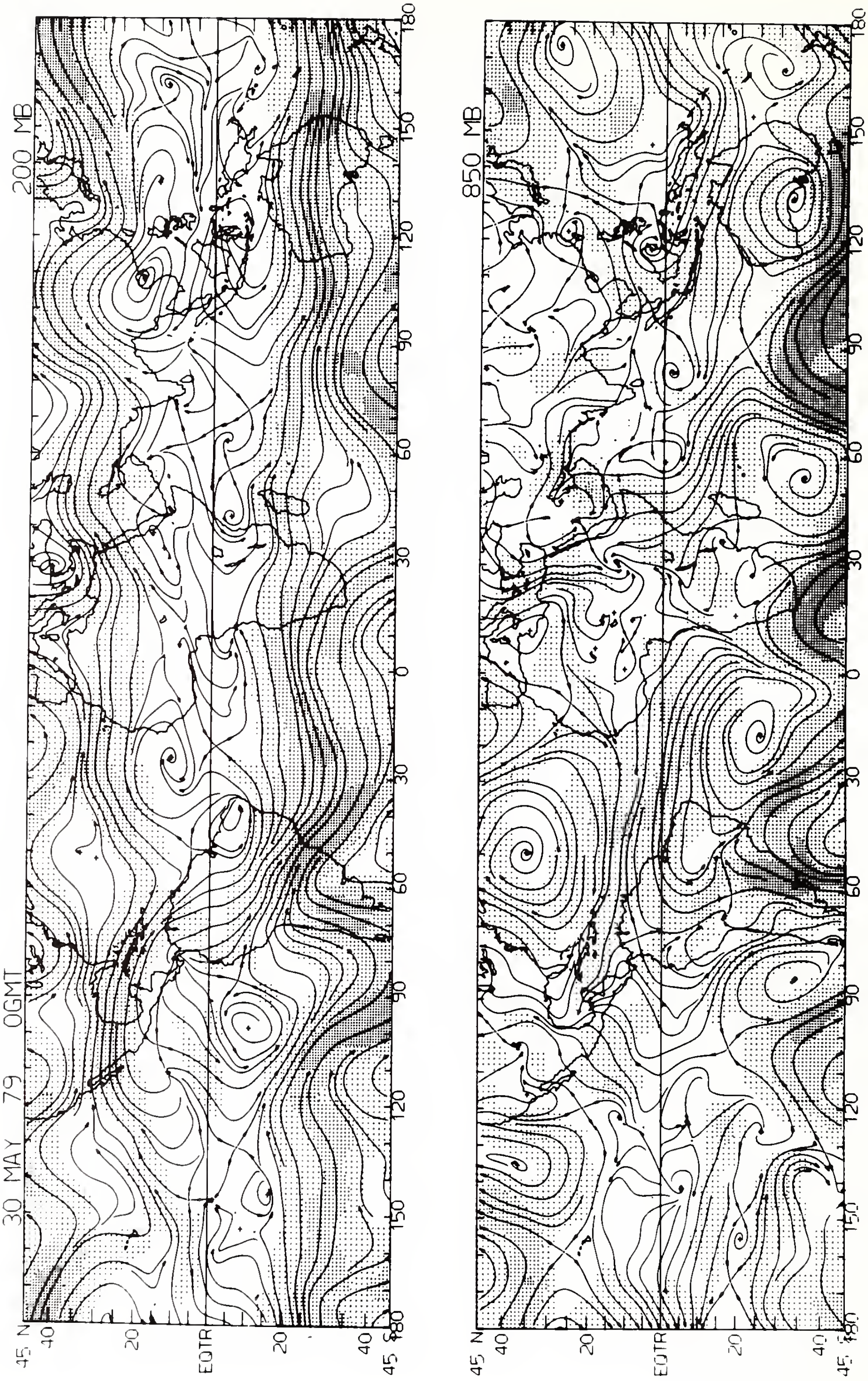
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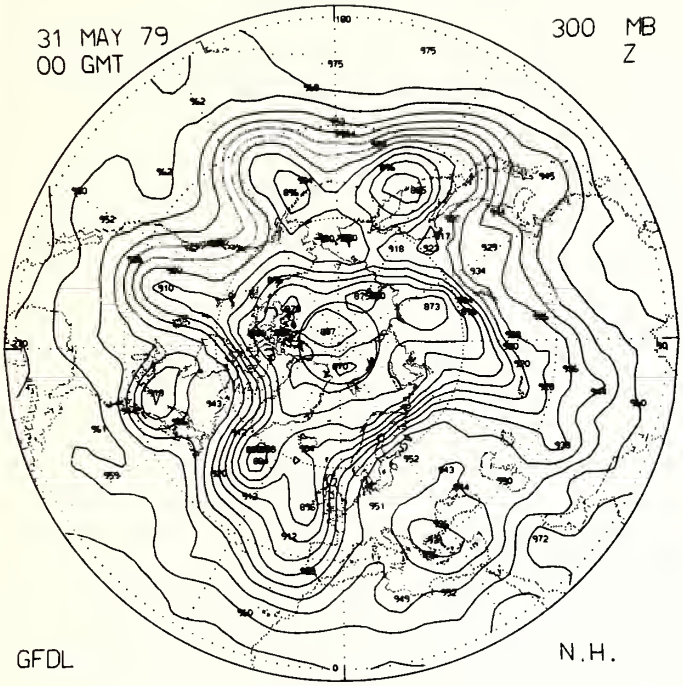
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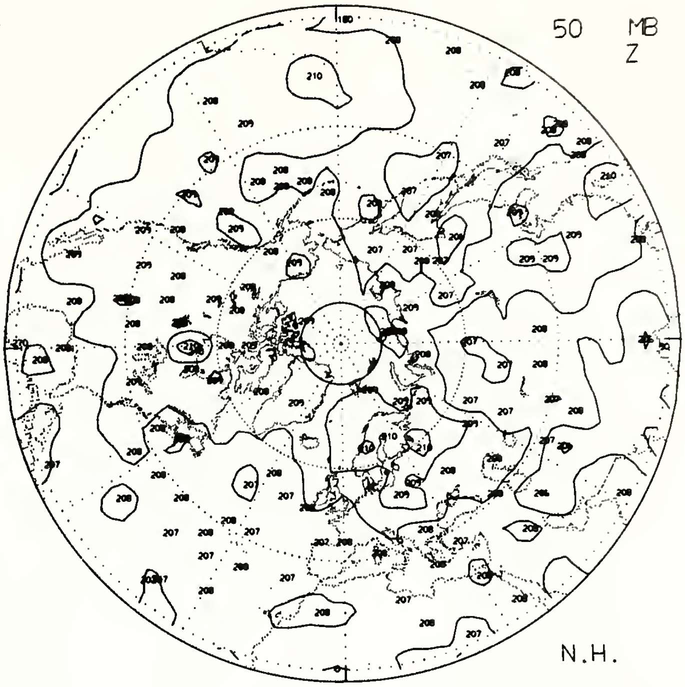
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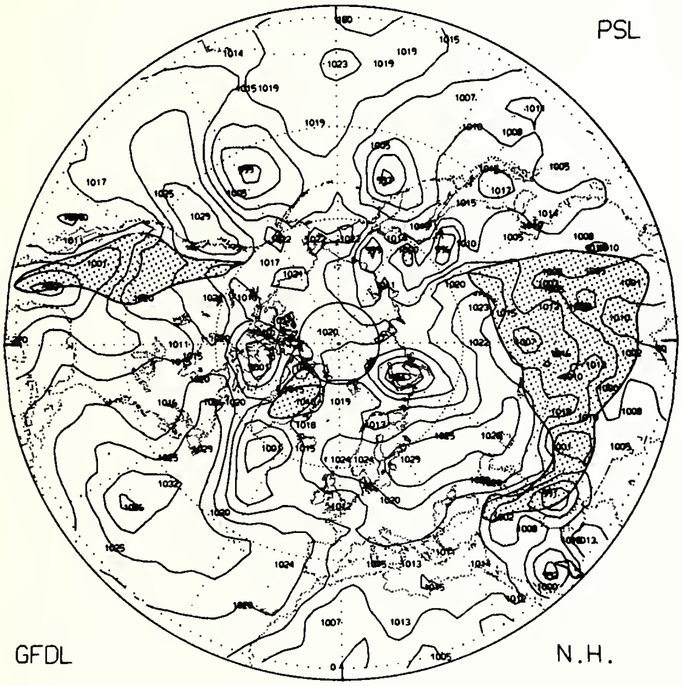
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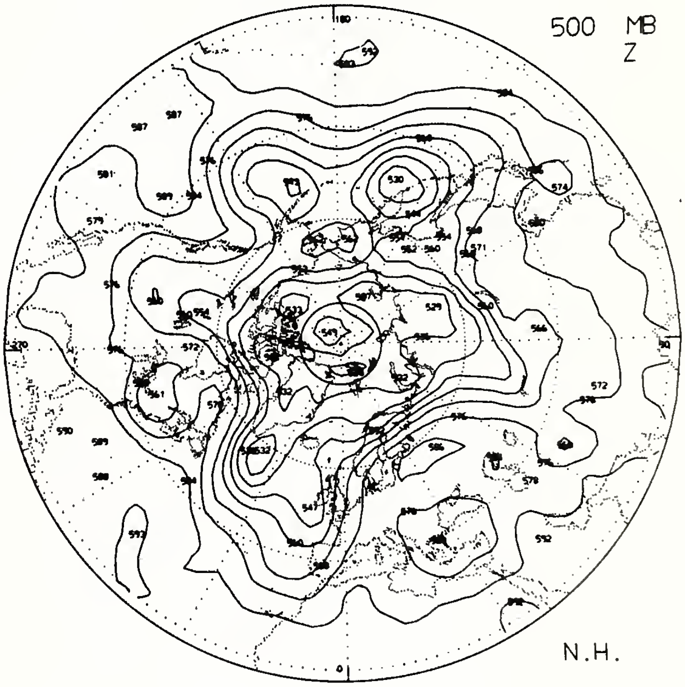
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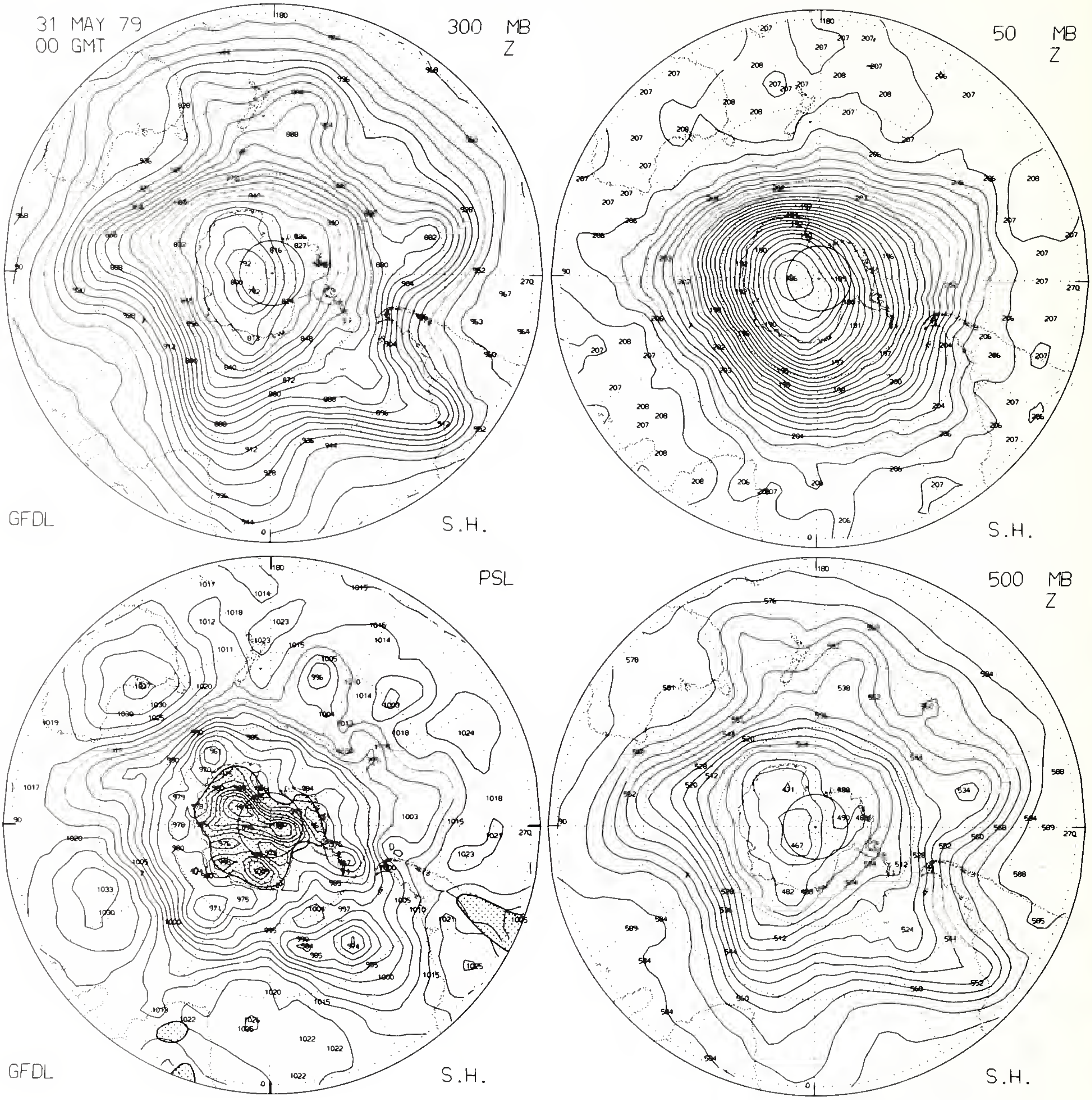
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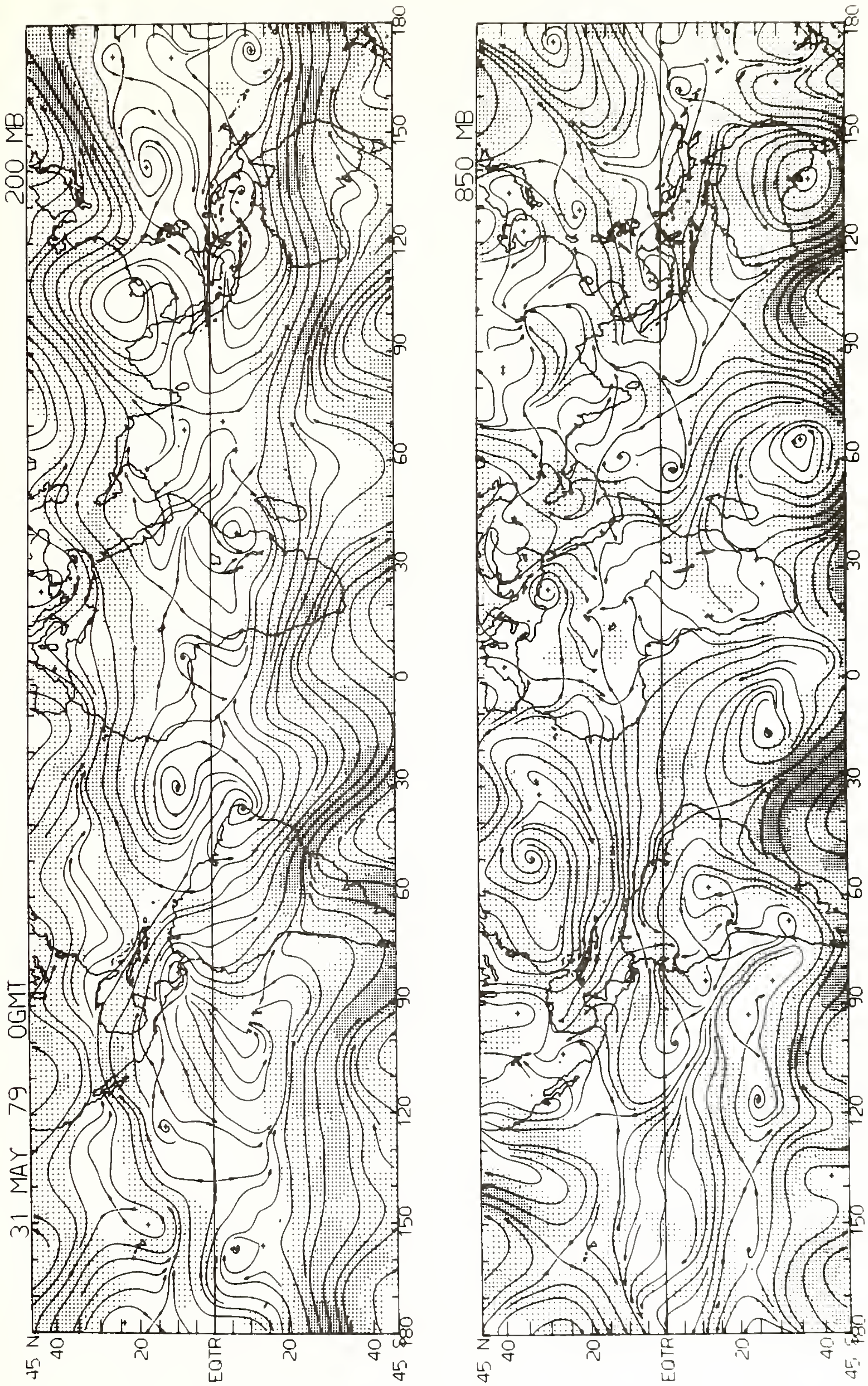

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